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Contents


II *Non-legislative acts*

REGULATIONS

★ **Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators** [1] ..... 1


[1] Text with EEA relevance


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Acts whose titles are printed in light type are those relating to day-to-day management of agricultural matters, and are generally valid for a limited period.

The titles of all other acts are printed in bold type and preceded by an asterisk.

II

*(Non-legislative acts)*

# REGULATIONS

## COMMISSION REGULATION (EU) 2016/631

## of 14 April 2016

## establishing a network code on requirements for grid connection of generators

**(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003 ([1]), and in particular Article 6(11) thereof,

Whereas:

(1) The swift completion of a fully functioning and interconnected internal energy market is crucial to maintaining security of energy supply, increasing competitiveness and ensuring that all consumers can purchase energy at affordable prices.

(2) Regulation (EC) No 714/2009 sets out non-discriminatory rules governing access to the network for cross-border exchanges in electricity with a view to ensuring the proper functioning of the internal market in electricity. In addition Article 5 of Directive 2009/72/EC of the European Parliament and of the Council ([2]) requires that Member States or, where Member States have so provided, regulatory authorities ensure, inter alia, that objective and non-discriminatory technical rules are developed which establish minimum technical design and operational requirements for the connection to the system. Where requirements constitute terms and conditions for connection to national networks, Article 37(6) of the same Directive requires regulatory authorities to be responsible for fixing or approving at least the methodologies used to calculate or establish them. In order to provide system security within the interconnected transmission system, it is essential to establish a common understanding of the requirements applicable to power-generating modules. Those requirements that contribute to maintaining, preserving and restoring system security in order to facilitate proper functioning of the internal electricity market within and between synchronous areas, and to achieve cost efficiencies, should be regarded as cross-border network issues and market integration issues.

(3) Harmonised rules for grid connection for power-generating modules should be set out in order to provide a clear legal framework for grid connections, facilitate Union-wide trade in electricity, ensure system security, facilitate the integration of renewable electricity sources, increase competition and allow more efficient use of the network and resources, for the benefit of consumers.

(4) System security depends partly on the technical capabilities of power-generating modules. Therefore regular coordination at the level of the transmission and distribution networks and adequate performance of the

([1]) OJ L 211, 14.8.2009, p. 15.
([2]) Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC (OJ L 211, 14.8.2009, p. 55).

equipment connected to the transmission and distribution networks with sufficient robustness to cope with disturbances and to help to prevent any major disruption or to facilitate restoration of the system after a collapse are fundamental prerequisites.

(5) Secure system operation is only possible if there is close cooperation between power-generating facility owners and system operators. In particular, the functioning of the system under abnormal operating conditions depends on the response of power-generating modules to deviations from the reference 1 per unit (pu) values of voltage and nominal frequency. In the context of system security, the networks and the power-generating modules should be considered as one entity from a system engineering point of view, given that those parts are interdependent. Therefore, as a prerequisite for grid connection, relevant technical requirements should be set for power-generating modules.

(6) Regulatory authorities should consider the reasonable costs effectively incurred by system operators in the implementation of this Regulation when fixing or approving transmission or distribution tariffs or their methodologies or when approving the terms and conditions for connection and access to national networks in accordance with Article 37(1) and (6) of Directive 2009/72/EC and with Article 14 of Regulation (EC) No 714/2009.

(7) Different synchronous electricity systems in the Union have different characteristics which need to be taken into account when setting the requirements for generators. It is therefore appropriate to consider regional specificities when establishing network connection rules as required by Article 8(6) of Regulation (EC) No 714/2009.

(8) In view of the need to provide regulatory certainty, the requirements of this Regulation should apply to new generating facilities but should not apply to existing generating modules and generating modules already at an advanced stage of planning but not yet completed unless the relevant regulatory authority or Member State decides otherwise based on evolution of system requirements and a full cost-benefit analysis, or where there has been substantial modernisation of those generating facilities.

(9) The significance of power-generating modules should be based on their size and their effect on the overall system. Synchronous machines should be classed on the machine size and include all the components of a generating facility that normally run indivisibly, such as separate alternators driven by the separate gas and steam turbines of a single combined-cycle gas turbine installation. For a facility including several such combined-cycle gas turbine installations, each should be assessed on its size, and not on the whole capacity of the facility. Non-synchronously connected power-generating units, where they are collected together to form an economic unit and where they have a single connection point should be assessed on their aggregated capacity.

(10) In view of the different voltage level at which generators are connected and their maximum generating capacity, this Regulation should make a distinction between different types of generators by establishing different levels of requirements. This Regulation does not set the rules to determine the voltage level of the connection point to which the power-generating module shall be connected.

(11) The requirements applicable to type A power-generating modules should be set at the basic level necessary to ensure capabilities of generation with limited automated response and minimal system operator control. They should ensure that there is no large-scale loss of generation over system operational ranges, thereby minimising critical events, and include requirements necessary for widespread intervention during system-critical events.

(12) The requirements applicable to type B power-generating modules should provide for a wider range of automated dynamic response with greater resilience to operational events, in order to ensure the use of this dynamic response, and a higher level of system operator control and information to utilise those capabilities. They ensure an automated response to mitigate the impact of, and maximise dynamic generation response to, system events.

(13) The requirements applicable to type C power-generating modules should provide for a refined, stable and highly controllable real-time dynamic response aiming to provide principle ancillary services to ensure security of supply. Those requirements should cover all system states with consequential detailed specification of interactions of requirements, functions, control and information to utilise those capabilities and ensure the real-time system response necessary to avoid, manage and respond to system events. Those requirements should also provide for sufficient capability of generating modules to respond to both intact and system disturbed situations, and should provide the information and control necessary to utilise generation in different situations.

(14) The requirements applicable to type D power-generating modules should be specific to higher voltage connected generation with an impact on control and operation of the entire system. They should ensure stable operation of the interconnected system, allowing the use of ancillary services from generation Europe-wide.

(15) The requirements should be based on the principles of non-discrimination and transparency as well as on the principle of optimisation between the highest overall efficiency and lowest total cost for all involved parties. Therefore those requirements should reflect the differences in the treatment of generation technologies with different inherent characteristics, and avoid unnecessary investments in some geographical areas in order to take into account their respective regional specificities. Transmission system operators ('TSOs') and distribution system operators ('DSOs') including closed distribution system operators ('CDSOs') can take those differences into account when defining the requirements in accordance with the provisions of this Regulation, whilst recognising that the thresholds which determine whether a system is a transmission system or a distribution system are established at the national level.

(16) Due to its cross-border impact, this Regulation should aim at the same frequency-related requirements for all voltage levels, at least within a synchronous area. That is necessary because, within a synchronous area, a change in frequency in one Member State would immediately impact frequency and could damage equipment in all other Member States.

(17) To ensure system security, it should be possible for power-generating modules in each synchronous area of the interconnected system to remain connected to the system for specified frequency and voltage ranges.

(18) This Regulation should provide for ranges of parameters for national choices for fault-ride-through capability to maintain a proportionate approach reflecting varying system needs such as the level of renewable energy sources ('RES') and existing network protection schemes, both transmission and distribution. In view of the configuration of some networks, the upper limit for fault-ride-through requirements should be 250 milliseconds. However, given that the most common fault clearing time in Europe is currently 150 milliseconds it leaves scope for the entity, as designated by the Member State to approve the requirements of this Regulation, to verify that a longer requirement is necessary before approving it.

(19) When defining the pre-fault and post-fault conditions for the fault-ride-through capability, taking into account system characteristics such as network topology and generation mix, the relevant TSO should decide whether priority is given to pre-fault operating conditions of power-generating modules or to longer fault clearance times.

(20) Ensuring appropriate reconnection after an incidental disconnection due to a network disturbance is important to the functioning of the interconnected system. Proper network protection is essential for maintaining system stability and security, particularly in case of disturbances to the system. Protection schemes can prevent aggravation of disturbances and limit their consequences.

(21) Adequate information exchange between system operators and power-generating facility owners is a prerequisite for enabling system operators to maintain system stability and security. System operators need to have a continuous overview of the state of the system, which includes information on the operating conditions of power-generating modules, as well as the possibility to communicate with them in order to direct operational instructions.

(22) In emergency situations which could endanger system stability and security, system operators should have the possibility to instruct that the output of power-generating modules be adjusted in a way which allows system operators to meet their responsibilities for system security.

(23) Voltage ranges should be coordinated between interconnected systems because they are crucial to secure planning and operation of a power system within a synchronous area. Disconnections because of voltage disturbances have an impact on neighbouring systems. Failure to specify voltage ranges could lead to widespread uncertainty in planning and operation of the system with respect to operation beyond normal operating conditions.

(24) The reactive power capability needs depend on several factors including the degree of network meshing and the ratio of in-feed and consumption, which should be taken into account when establishing reactive power requirements. When regional system characteristics vary within a systems operator's area of responsibility, more

than one profile could be appropriate. Reactive power production, known as lagging, at high voltages and reactive power consumption, known as leading, at low voltages might not be necessary. Reactive power requirements could put constraints on the design and operation of power-generating facilities. Therefore it is important that the capabilities actually required for efficient system operation be thoroughly assessed.

(25) Synchronous power-generating modules have an inherent capability to resist or slow down frequency deviations, a characteristic which many RES technologies do not have. Therefore countermeasures should be adopted, to avoid a larger rate of change of frequency during high RES production. Synthetic inertia could facilitate further expansion of RES, which do not naturally contribute to inertia.

(26) Appropriate and proportionate compliance testing should be introduced so that system operators can ensure operational security.

(27) The regulatory authorities, Member States and system operators should ensure that, in the process of developing and approving the requirements for network connection, they are harmonised to the extent possible, in order to ensure full market integration. Established technical standards should be taken into particular consideration in the development of connection requirements.

(28) A process for derogating from the rules should be set out in this Regulation to take into account local circumstances where exceptionally, for example, compliance with those rules could jeopardise the stability of the local network or where the safe operation of a power-generating module might require operating conditions that are not in line with the Regulation. In the case of particular combined heat and power plants, which bring wider efficiency benefits, applying the rules set out in this Regulation could result in disproportionate costs and lead to the loss of those efficiency benefits.

(29) Subject to approval by the relevant regulatory authority, or other authority where applicable in a Member State, system operators should be allowed to propose derogations for certain classes of power-generating modules.

(30) This Regulation has been adopted on the basis of Regulation (EC) No 714/2009 which it supplements and of which it forms an integral part. References to Regulation (EC) No 714/2009 in other legal acts should be understood as also referring to this Regulation.

(31) The measures provided for in this Regulation are in accordance with the opinion of the Committee referred to in Article 23(1) of Regulation (EC) No 714/2009

HAS ADOPTED THIS REGULATION:

TITLE I

## GENERAL PROVISIONS

*Article 1*

### Subject matter

This Regulation establishes a network code which lays down the requirements for grid connection of power-generating facilities, namely synchronous power-generating modules, power park modules and offshore power park modules, to the interconnected system. It, therefore, helps to ensure fair conditions of competition in the internal electricity market, to ensure system security and the integration of renewable electricity sources, and to facilitate Union-wide trade in electricity.

This regulation also lays down the obligations for ensuring that system operators make appropriate use of the power-generating facilities' capabilities in a transparent and non-discriminatory manner to provide a level playing field throughout the Union.

*Article 2*

**Definitions**

For the purposes of this Regulation, the definitions in Article 2 of Directive 2012/27/EU of the European Parliament and of the Council [1], Article 2 of Regulation (EC) No 714/2009, Article 2 of Commission Regulation (EU) 2015/1222 [2] Article 2 of Commission Regulation (EU) No 543/2013 [3] and Article 2 of Directive 2009/72/EC shall apply.

In addition, the following definitions shall apply:

(1) 'entity' means a regulatory authority, other national authority, system operator or other public or private body appointed under national law.

(2) 'synchronous area' means an area covered by synchronously interconnected TSOs, such as the synchronous areas of Continental Europe, Great Britain, Ireland-Northern Ireland and Nordic and the power systems of Lithuania, Latvia and Estonia, together referred to as 'Baltic' which are part of a wider synchronous area;

(3) 'voltage' means the difference in electrical potential between two points measured as the root-mean-square value of the positive sequence phase-to-phase voltages at fundamental frequency;

(4) 'apparent power' means the product of voltage and current at fundamental frequency, and the square root of three in the case of three-phase systems, usually expressed in kilovolt-amperes ('kVA') or megavolt-amperes ('MVA');

(5) 'power-generating module' means either a synchronous power-generating module or a power park module;

(6) 'power-generating facility' means a facility that converts primary energy into electrical energy and which consists of one or more power-generating modules connected to a network at one or more connection points;

(7) 'power-generating facility owner' means a natural or legal entity owning a power-generating facility;

(8) 'main generating plant' means one or more of the principal items of equipment required to convert the primary source of energy into electricity;

(9) 'synchronous power-generating module' means an indivisible set of installations which can generate electrical energy such that the frequency of the generated voltage, the generator speed and the frequency of network voltage are in a constant ratio and thus in synchronism;

(10) 'power-generating module document' or 'PGMD' means a document provided by the power-generating facility owner to the relevant system operator for a type B or C power-generating module which confirms that the power-generating module's compliance with the technical criteria set out in this Regulation has been demonstrated and provides the necessary data and statements, including a statement of compliance;

(11) 'relevant TSO' means the TSO in whose control area a power-generating module, a demand facility, a distribution system or a HVDC system is or will be connected to the network at any voltage level;

(12) 'network' means a plant and apparatus connected together in order to transmit or distribute electricity;

(13) 'relevant system operator' means the transmission system operator or distribution system operator to whose system a power-generating module, demand facility, distribution system or HVDC system is or will be connected;

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[1] Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1).

[2] Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management (OJ L 197, 25.7.2015, p. 24).

[3] Commission Regulation (EU) No 543/2013 of 14 June 2013 on submission and publication of data in electricity markets and amending Annex I to Regulation (EC) No 714/2009 of the European Parliament and of the Council (OJ L 163, 15.6.2013, p. 1).

(14) 'connection agreement' means a contract between the relevant system operator and either the power-generating facility owner, demand facility owner, distribution system operator or HVDC system owner, which includes the relevant site and specific technical requirements for the power-generating facility, demand facility, distribution system, distribution system connection or HVDC system;

(15) 'connection point' means the interface at which the power-generating module, demand facility, distribution system or HVDC system is connected to a transmission system, offshore network, distribution system, including closed distribution systems, or HVDC system, as identified in the connection agreement;

(16) 'maximum capacity' or 'Pmax' means the maximum continuous active power which a power-generating module can produce, less any demand associated solely with facilitating the operation of that power-generating module and not fed into the network as specified in the connection agreement or as agreed between the relevant system operator and the power-generating facility owner;

(17) 'power park module' or 'PPM' means a unit or ensemble of units generating electricity, which is either non-synchronously connected to the network or connected through power electronics, and that also has a single connection point to a transmission system, distribution system including closed distribution system or HVDC system;

(18) 'offshore power park module' means a power park module located offshore with an offshore connection point;

(19) 'synchronous compensation operation' means the operation of an alternator without prime mover to regulate voltage dynamically by production or absorption of reactive power;

(20) 'active power' means the real component of the apparent power at fundamental frequency, expressed in watts or multiples thereof such as kilowatts ('kW') or megawatts ('MW');

(21) 'pump-storage' means a hydro unit in which water can be raised by means of pumps and stored to be used for the generation of electrical energy;

(22) 'frequency' means the electric frequency of the system expressed in hertz that can be measured in all parts of the synchronous area under the assumption of a consistent value for the system in the time frame of seconds, with only minor differences between different measurement locations. Its nominal value is 50Hz;

(23) 'droop' means the ratio of a steady-state change of frequency to the resulting steady-state change in active power output, expressed in percentage terms. The change in frequency is expressed as a ratio to nominal frequency and the change in active power expressed as a ratio to maximum capacity or actual active power at the moment the relevant threshold is reached;

(24) 'minimum regulating level' means the minimum active power, as specified in the connection agreement or as agreed between the relevant system operator and the power-generating facility owner, down to which the power-generating module can control active power;

(25) 'setpoint' means the target value for any parameter typically used in control schemes;

(26) 'instruction' means any command, within its authority, given by a system operator to a power-generating facility owner, demand facility owner, distribution system operator or HVDC system owner in order to perform an action;

(27) 'secured fault' means a fault which is successfully cleared according to the system operator's planning criteria;

(28) 'reactive power' means the imaginary component of the apparent power at fundamental frequency, usually expressed in kilovar ('kVAr') or megavar ('MVAr');

(29) 'fault-ride-through' means the capability of electrical devices to be able to remain connected to the network and operate through periods of low voltage at the connection point caused by secured faults;

(30) 'alternator' means a device that converts mechanical energy into electrical energy by means of a rotating magnetic field;

(31) 'current' means the rate at which electric charge flows which is measured by the root-mean-square value of the positive sequence of the phase current at fundamental frequency;

(32) 'stator' means the portion of a rotating machine which includes the stationary magnetic parts with their associated windings;

(33) 'inertia' means the property of a rotating rigid body, such as the rotor of an alternator, such that it maintains its state of uniform rotational motion and angular momentum unless an external torque is applied;

(34) 'synthetic inertia' means the facility provided by a power park module or HVDC system to replace the effect of inertia of a synchronous power-generating module to a prescribed level of performance;

(35) 'frequency control' means the capability of a power-generating module or HVDC system to adjust its active power output in response to a measured deviation of system frequency from a setpoint, in order to maintain stable system frequency;

(36) 'frequency sensitive mode' or 'FSM' means the operating mode of a power-generating module or HVDC system in which the active power output changes in response to a change in system frequency, in such a way that it assists with the recovery to target frequency;

(37) 'limited frequency sensitive mode — overfrequency' or 'LFSM-O' means a power-generating module or HVDC system operating mode which will result in active power output reduction in response to a change in system frequency above a certain value;

(38) 'limited frequency sensitive mode — underfrequency' 'LFSM-U' means a power-generating module or HVDC system operating mode which will result in active power output increase in response to a change in system frequency below a certain value;

(39) 'frequency response deadband' means an interval used intentionally to make the frequency control unresponsive;

(40) 'frequency response insensitivity' means the inherent feature of the control system specified as the minimum magnitude of change in the frequency or input signal that results in a change of output power or output signal;

(41) 'P-Q-capability diagram' means a diagram describing the reactive power capability of a power-generating module in the context of varying active power at the connection point;

(42) 'steady-state stability' means the ability of a network or a synchronous power-generating module to revert and maintain stable operation following a minor disturbance;

(43) 'island operation' means the independent operation of a whole network or part of a network that is isolated after being disconnected from the interconnected system, having at least one power-generating module or HVDC system supplying power to this network and controlling the frequency and voltage;

(44) 'houseload operation' means the operation which ensures that power-generating facilities are able to continue to supply their in-house loads in the event of network failures resulting in power-generating modules being disconnected from the network and tripped onto their auxiliary supplies;

(45) 'black start capability' means the capability of recovery of a power-generating module from a total shutdown through a dedicated auxiliary power source without any electrical energy supply external to the power-generating facility;

(46) 'authorised certifier' means an entity that issues equipment certificates and power-generating module documents and whose accreditation is given by the national affiliate of the European cooperation for Accreditation ('EA'), established in accordance with Regulation (EC) No 765/2008 of the European Parliament and of the Council ([1]);

(47) 'equipment certificate' means a document issued by an authorised certifier for equipment used by a power-generating module, demand unit, distribution system, demand facility or HVDC system. The equipment certificate defines the scope of its validity at a national or other level at which a specific value is selected from the range allowed at a European level. For the purpose of replacing specific parts of the compliance process, the equipment certificate may include models that have been verified against actual test results;

(48) 'excitation control system' means a feedback control system that includes the synchronous machine and its excitation system;

(49) 'U-Q/Pmax-profile' means a profile representing the reactive power capability of a power-generating module or HVDC converter station in the context of varying voltage at the connection point;

([1]) Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93 (OJ L 218, 13.8.2008, p. 30).

(50) 'minimum stable operating level' means the minimum active power, as specified in the connection agreement or as agreed between the relevant system operator and the power-generating facility owner, at which the power-generating module can be operated stably for an unlimited time;

(51) 'overexcitation limiter' means a control device within the AVR which prevents the rotor of an alternator from overloading by limiting the excitation current;

(52) 'underexcitation limiter' means a control device within the AVR, the purpose of which is to prevent the alternator from losing synchronism due to lack of excitation;

(53) 'automatic voltage regulator' or 'AVR' means the continuously acting automatic equipment controlling the terminal voltage of a synchronous power-generating module by comparing the actual terminal voltage with a reference value and controlling the output of an excitation control system;

(54) 'power system stabiliser' or 'PSS' means an additional functionality of the AVR of a synchronous power-generating module whose purpose is to damp power oscillations;

(55) 'fast fault current' means a current injected by a power park module or HVDC system during and after a voltage deviation caused by an electrical fault with the aim of identifying a fault by network protection systems at the initial stage of the fault, supporting system voltage retention at a later stage of the fault and system voltage restoration after fault clearance;

(56) 'power factor' means the ratio of the absolute value of active power to apparent power;

(57) 'slope' means the ratio of the change in voltage, based on reference 1 pu voltage, to a change in reactive power in-feed from zero to maximum reactive power, based on maximum reactive power;

(58) 'offshore grid connection system' means the complete interconnection between an offshore connection point and the onshore system at the onshore grid interconnection point;

(59) 'onshore grid interconnection point' means the point at which the offshore grid connection system is connected to the onshore network of the relevant system operator;

(60) 'installation document' means a simple structured document containing information about a type A power-generating module or a demand unit, with demand response connected below 1 000 V, and confirming its compliance with the relevant requirements;

(61) 'statement of compliance' means a document provided by the power-generating facility owner, demand facility owner, distribution system operator or HVDC system owner to the system operator stating the current status of compliance with the relevant specifications and requirements;

(62) 'final operational notification' or 'FON' means a notification issued by the relevant system operator to a power-generating facility owner, demand facility owner, distribution system operator or HVDC system owner who complies with the relevant specifications and requirements, allowing them to operate respectively a power-generating module, demand facility, distribution system or HVDC system by using the grid connection;

(63) 'energisation operational notification' or 'EON' means a notification issued by the relevant system operator to a power-generating facility owner, demand facility owner, distribution system operator or HVDC system owner prior to energisation of its internal network;

(64) 'interim operational notification' or 'ION' means a notification issued by the relevant system operator to a power-generating facility owner, demand facility owner, distribution system operator or HVDC system owner which allows them to operate respectively a power-generating module, demand facility, distribution system or HVDC system by using the grid connection for a limited period of time and to initiate compliance tests to ensure compliance with the relevant specifications and requirements;

(65) 'limited operational notification' or 'LON' means a notification issued by the relevant system operator to a power-generating facility owner, demand facility owner, distribution system operator or HVDC system owner who had previously attained FON status but is temporarily subject to either a significant modification or loss of capability resulting in non-compliance with the relevant specifications and requirements.

*Article 3*

**Scope of application**

1. The connection requirements set out in this Regulation shall apply to new power-generating modules which are considered significant in accordance with Article 5, unless otherwise provided.

The relevant system operator shall refuse to allow the connection of a power-generating module which does not comply with the requirements set out in this Regulation and which is not covered by a derogation granted by the regulatory authority, or other authority where applicable in a Member State pursuant to Article 60. The relevant system operator shall communicate such refusal, by means of a reasoned statement in writing, to the power-generating facility owner and, unless specified otherwise by the regulatory authority, to the regulatory authority.

2. This Regulation shall not apply to:

(a) power-generating modules connected to the transmission system and distribution systems, or to parts of the transmission system or distribution systems, of islands of Member States of which the systems are not operated synchronously with either the Continental Europe, Great Britain, Nordic, Ireland and Northern Ireland or Baltic synchronous area;

(b) power-generating modules that were installed to provide back-up power and operate in parallel with the system for less than five minutes per calendar month while the system is in normal system state. Parallel operation during maintenance or commissioning tests of that power-generating module shall not count towards the five-minute limit;

(c) power-generating modules that do not have a permanent connection point and are used by the system operators to temporarily provide power when normal system capacity is partly or completely unavailable;

(d) storage devices except for pump-storage power-generating modules in accordance with Article 6(2).

*Article 4*

**Application to existing power-generating modules**

1. Existing power-generating modules are not subject to the requirements of this Regulation, except where:

(a) a type C or type D power-generating module has been modified to such an extent that its connection agreement must be substantially revised in accordance with the following procedure:

  (i) power-generating facility owners who intend to undertake the modernisation of a plant or replacement of equipment impacting the technical capabilities of the power-generating module shall notify their plans to the relevant system operator in advance;

  (ii) if the relevant system operator considers that the extent of the modernisation or replacement of equipment is such that a new connection agreement is required, the system operator shall notify the relevant regulatory authority or, where applicable, the Member State; and

  (iii) the relevant regulatory authority or, where applicable, the Member State shall decide if the existing connection agreement needs to be revised or a new connection agreement is required and which requirements of this Regulation shall apply; or

(b) a regulatory authority or, where applicable, a Member State decides to make an existing power-generating module subject to all or some of the requirements of this Regulation, following a proposal from the relevant TSO in accordance with paragraphs 3, 4 and 5.

2. For the purposes of this Regulation, a power-generating module shall be considered existing if:

(a) it is already connected to the network on the date of entry into force of this Regulation; or

(b) the power-generating facility owner has concluded a final and binding contract for the purchase of the main generating plant by two years after the entry into force of the Regulation. The power-generating facility owner must notify the relevant system operator and relevant TSO of conclusion of the contract within 30 months after the entry into force of the Regulation.

The notification submitted by the power-generating facility owner to the relevant system operator and to the relevant TSO shall at least indicate the contract title, its date of signature and date of entry into force and the specifications of the main generating plant to be constructed, assembled or purchased.

A Member State may provide that in specified circumstances the regulatory authority may determine whether the power-generating module is to be considered an existing power-generating module or a new power-generating module.

3. Following a public consultation in accordance with Article 10 and in order to address significant factual changes in circumstances, such as the evolution of system requirements including penetration of renewable energy sources, smart grids, distributed generation or demand response, the relevant TSO may propose to the regulatory authority concerned, or where applicable, to the Member State to extend the application of this Regulation to existing power-generating modules.

For that purpose a sound and transparent quantitative cost-benefit analysis shall be carried out, in accordance with Articles 38 and 39. The analysis shall indicate:

(a) the costs, in regard to existing power-generating modules, of requiring compliance with this Regulation;

(b) the socioeconomic benefit resulting from applying the requirements set out in this Regulation; and

(c) the potential of alternative measures to achieve the required performance.

4. Before carrying out the quantitative cost-benefit analysis referred to in paragraph 3, the relevant TSO shall:

(a) carry out a preliminary qualitative comparison of costs and benefits;

(b) obtain approval from the relevant regulatory authority or, where applicable, the Member State.

5. The relevant regulatory authority or, where applicable, the Member State shall decide on the extension of the applicability of this Regulation to existing power-generating modules within six months of receipt of the report and the recommendation of the relevant TSO in accordance with Article 38(4). The decision of the regulatory authority or, where applicable, the Member State shall be published.

6. The relevant TSO shall take account of the legitimate expectations of power-generating facility owners as part of the assessment of the application of this Regulation to existing power-generating modules.

7. The relevant TSO may assess the application of some or all of the provisions of this Regulation to existing power-generating modules every three years in accordance with the criteria and process set out in paragraphs 3 to 5.

*Article 5*

**Determination of significance**

1. The power-generating modules shall comply with the requirements on the basis of the voltage level of their connection point and their maximum capacity according to the categories set out in paragraph 2.

2. Power-generating modules within the following categories shall be considered as significant:

(a) connection point below 110 kV and maximum capacity of 0,8 kW or more (type A);

(b) connection point below 110 kV and maximum capacity at or above a threshold proposed by each relevant TSO in accordance with the procedure laid out in paragraph 3 (type B). This threshold shall not be above the limits for type B power-generating modules contained in Table 1;

(c) connection point below 110 kV and maximum capacity at or above a threshold specified by each relevant TSO in accordance with paragraph 3 (type C). This threshold shall not be above the limits for type C power-generating modules contained in Table 1; or

(d) connection point at 110 kV or above (type D). A power-generating module is also of type D if its connection point is below 110 kV and its maximum capacity is at or above a threshold specified in accordance with paragraph 3. This threshold shall not be above the limit for type D power-generating modules contained in Table 1.

*Table 1*

**Limits for thresholds for type B, C and D power-generating modules**

| Synchronous areas | Limit for maximum capacity threshold from which a power-generating module is of type B | Limit for maximum capacity threshold from which a power-generating module is of type C | Limit for maximum capacity threshold from which a power-generating module is of type D |
|---|---|---|---|
| Continental Europe | 1 MW | 50 MW | 75 MW |
| Great Britain | 1 MW | 50 MW | 75 MW |
| Nordic | 1,5 MW | 10 MW | 30 MW |
| Ireland and Northern Ireland | 0,1 MW | 5 MW | 10 MW |
| Baltic | 0,5 MW | 10 MW | 15 MW |

3. Proposals for maximum capacity thresholds for types B, C and D power-generating modules shall be subject to approval by the relevant regulatory authority or, where applicable, the Member State. In forming proposals the relevant TSO shall coordinate with adjacent TSOs and DSOs and shall conduct a public consultation in accordance with Article 10. A proposal by the relevant TSO to change the thresholds shall not be made sooner than three years after the previous proposal.

4. Power-generating facility owners shall assist this process and provide data as requested by the relevant TSO.

5. If, as a result of modification of the thresholds, a power-generating module qualifies under a different type, the procedure laid down in Article 4(3) concerning existing power-generating modules shall apply before compliance with the requirements for the new type is required.

*Article 6*

**Application to power-generating modules, pump-storage power-generating modules, combined heat and power facilities, and industrial sites**

1. Offshore power-generating modules connected to the interconnected system shall meet the requirements for onshore power-generating modules, unless the requirements are modified for this purpose by the relevant system operator or unless the connection of power park modules is via a high voltage direct current connection or via a network whose frequency is not synchronously coupled to that of the main interconnected system (such as via a back-to-back convertor scheme).

2. Pump-storage power-generating modules shall fulfil all the relevant requirements in both generating and pumping operation mode. Synchronous compensation operation of pump-storage power-generating modules shall not be limited in time by the technical design of power-generating modules. Pump-storage variable speed power-generating modules shall fulfil the requirements applicable to synchronous power-generating modules as well as those set out in point (b) of Article 20(2), if they qualify as type B, C or D.

3. With respect to power-generating modules embedded in the networks of industrial sites, power-generating facility owners, system operators of industrial sites and relevant system operators whose network is connected to the network of an industrial site shall have the right to agree on conditions for disconnection of such power-generating modules together with critical loads, which secure production processes, from the relevant system operator's network. The exercise of this right shall be coordinated with the relevant TSO.

4. Except for requirements under paragraphs 2 and 4 of Article 13 or where otherwise stated in the national framework, requirements of this Regulation relating to the capability to maintain constant active power output or to modulate active power output shall not apply to power-generating modules of facilities for combined heat and power production embedded in the networks of industrial sites, where all of the following criteria are met:

(a) the primary purpose of those facilities is to produce heat for production processes of the industrial site concerned;

(b) heat and power-generating is inextricably interlinked, that is to say any change of heat generation results inadvertently in a change of active power-generating and vice versa;

(c) the power-generating modules are of type A, B, C or, in the case of the Nordic synchronous area, type D in accordance with points (a) to (c) of Article 5(2).

5. Combined heat and power-generating facilities shall be assessed on the basis of their electrical maximum capacity.

*Article 7*

**Regulatory aspects**

1. Requirements of general application to be established by relevant system operators or TSOs under this Regulation shall be subject to approval by the entity designated by the Member State and be published. The designated entity shall be the regulatory authority unless otherwise provided by the Member State.

2. For site specific requirements to be established by relevant system operators or TSOs under this Regulation, Member States may require approval by a designated entity.

3. When applying this Regulation, Member States, competent entities and system operators shall:

(a) apply the principles of proportionality and non-discrimination;

(b) ensure transparency;

(c) apply the principle of optimisation between the highest overall efficiency and lowest total costs for all parties involved;

(d) respect the responsibility assigned to the relevant TSO in order to ensure system security, including as required by national legislation;

(e) consult with relevant DSOs and take account of potential impacts on their system;

(f) take into consideration agreed European standards and technical specifications.

4. The relevant system operator or TSO shall submit a proposal for requirements of general application, or the methodology used to calculate or establish them, for approval by the competent entity within two years of entry into force of this Regulation.

5. Where this Regulation requires the relevant system operator, relevant TSO, power-generating facility owner and/or the distribution system operator to seek agreement, they shall endeavour to do so within six months after a first proposal has been submitted by one party to the other parties. If no agreement has been found within this time frame, each party may request the relevant regulatory authority to issue a decision within six months.

6. Competent entities shall take decisions on proposals for requirements or methodologies within six months following the receipt of such proposals.

7. If the relevant system operator or TSO deems an amendment to requirements or methodologies as provided for and approved under paragraph 1 and 2 to be necessary, the requirements provided for in paragraphs 3 to 8 shall apply to the proposed amendment. System operators and TSOs proposing an amendment shall take into account the legitimate expectations, if any, of power-generating facility owners, equipment manufacturers and other stakeholders based on the initially specified or agreed requirements or methodologies.

8. Any party having a complaint against a relevant system operator or TSO in relation to that relevant system operator's or TSO's obligations under this Regulation may refer the complaint to the regulatory authority which, acting as dispute settlement authority, shall issue a decision within two months after receipt of the complaint. That period may be extended by two months where additional information is sought by the regulatory authority. That extended period may be further extended with the agreement of the complainant. The regulatory authority's decision shall have binding effect unless and until overruled on appeal.

9. Where the requirements under this Regulation are to be established by a relevant system operator that is not a TSO, Member States may provide that instead the TSO be responsible for establishing the relevant requirements.

*Article 8*

**Multiple TSOs**

1. Where more than one TSO exists in a Member State, this Regulation shall apply to all those TSOs.

2. Member States may, under the national regulatory regime, provide that the responsibility of a TSO to comply with one or some or all obligations under this Regulation is assigned to one or more specific TSOs.

*Article 9*

**Recovery of costs**

1. The costs borne by system operators subject to network tariff regulation and stemming from the obligations laid down in this Regulation shall be assessed by the relevant regulatory authorities. Costs assessed as reasonable, efficient and proportionate shall be recovered through network tariffs or other appropriate mechanisms.

2. If requested by the relevant regulatory authorities, system operators referred to in paragraph 1 shall, within three months of the request, provide the information necessary to facilitate assessment of the costs incurred.

*Article 10*

**Public consultation**

1. Relevant system operators and relevant TSOs shall carry out consultation with stakeholders, including the competent authorities of each Member State, on proposals to extend the applicability of this Regulation to existing power-generating modules in accordance with Article 4(3), for the proposal for thresholds in accordance with Article 5(3), and on the report prepared in accordance with Article 38(3) and the cost-benefit analysis undertaken in accordance with Article 63(2). The consultation shall last at least for a period of one month.

2. The relevant system operators or relevant TSOs shall duly take into account the views of the stakeholders resulting from the consultations prior to the submission of the draft proposal for thresholds, the report or cost benefit analysis for approval by the regulatory authority or, if applicable, the Member State. In all cases, a sound justification for including or not the views of the stakeholders shall be provided and published in a timely manner before, or simultaneously with, the publication of the proposal.

*Article 11*

**Stakeholder involvement**

The Agency for the Cooperation of Energy Regulators (the Agency), in close cooperation with the European Network of Transmission System Operators for Electricity (ENTSO for Electricity), shall organise stakeholder involvement regarding the requirements for grid connection of power-generating facilities, and other aspects of the implementation of this Regulation. This shall include regular meetings with stakeholders to identify problems and propose improvements notably related to the requirements for grid connection of power-generating facilities.

*Article 12*

**Confidentiality obligations**

1. Any confidential information received, exchanged or transmitted pursuant to this Regulation shall be subject to the conditions of professional secrecy laid down in paragraphs 2, 3 and 4.

2. The obligation of professional secrecy shall apply to any persons, regulatory authorities or entities subject to the provisions of this Regulation.

3. Confidential information received by the persons, regulatory authorities or entities referred to in paragraph 2 in the course of their duties may not be divulged to any other person or authority, without prejudice to cases covered by national law, the other provisions of this Regulation or other relevant Union law.

4. Without prejudice to cases covered by national or Union law, regulatory authorities, entities or persons who receive confidential information pursuant to this Regulation may use it only for the purpose of carrying out their duties under this Regulation.

TITLE II

**REQUIREMENTS**

*CHAPTER 1*

***General requirements***

*Article 13*

**General requirements for type A power-generating modules**

1. Type A power-generating modules shall fulfil the following requirements relating to frequency stability:

(a) With regard to frequency ranges:

(i) a power-generating module shall be capable of remaining connected to the network and operate within the frequency ranges and time periods specified in Table 2;

(ii) the relevant system operator, in coordination with the relevant TSO, and the power-generating facility owner may agree on wider frequency ranges, longer minimum times for operation or specific requirements for combined frequency and voltage deviations to ensure the best use of the technical capabilities of a power-generating module, if it is required to preserve or to restore system security;

(iii) the power-generating facility owner shall not unreasonably withhold consent to apply wider frequency ranges or longer minimum times for operation, taking account of their economic and technical feasibility.

(b) With regard to the rate of change of frequency withstand capability, a power-generating module shall be capable of staying connected to the network and operate at rates of change of frequency up to a value specified by the relevant TSO, unless disconnection was triggered by rate-of-change-of-frequency-type loss of mains protection. The relevant system operator, in coordination with the relevant TSO, shall specify this rate-of-change-of-frequency-type loss of mains protection.

*Table 2*

**Minimum time periods for which a power-generating module has to be capable of operating on different frequencies, deviating from a nominal value, without disconnecting from the network.**

| Synchronous area | Frequency range | Time period for operation |
|---|---|---|
| Continental Europe | 47,5 Hz-48,5 Hz | To be specified by each TSO, but not less than 30 minutes |
| | 48,5 Hz-49,0 Hz | To be specified by each TSO, but not less than the period for 47,5 Hz-48,5 Hz |
| | 49,0 Hz-51,0 Hz | Unlimited |
| | 51,0 Hz-51,5 Hz | 30 minutes |

| Synchronous area | Frequency range | Time period for operation |
|---|---|---|
| Nordic | 47,5 Hz-48,5 Hz | 30 minutes |
| | 48,5 Hz-49,0 Hz | To be specified by each TSO, but not less than 30 minutes |
| | 49,0 Hz-51,0 Hz | Unlimited |
| | 51,0 Hz-51,5 Hz | 30 minutes |
| Great Britain | 47,0 Hz-47,5 Hz | 20 seconds |
| | 47,5 Hz-48,5 Hz | 90 minutes |
| | 48,5 Hz-49,0 Hz | To be specified by each TSO, but not less than 90 minutes |
| | 49,0 Hz-51,0 Hz | Unlimited |
| | 51,0 Hz-51,5 Hz | 90 minutes |
| | 51,5 Hz-52,0 Hz | 15 minutes |
| Ireland and Northern Ireland | 47,5 Hz-48,5 Hz | 90 minutes |
| | 48,5 Hz-49,0 Hz | To be specified by each TSO, but not less than 90 minutes |
| | 49,0 Hz-51,0 Hz | Unlimited |
| | 51,0 Hz-51,5 Hz | 90 minutes |
| Baltic | 47,5 Hz-48,5 Hz | To be specified by each TSO, but not less than 30 minutes |
| | 48,5 Hz-49,0 Hz | To be specified by each TSO, but not less than the period for 47,5 Hz-48,5 Hz |
| | 49,0 Hz-51,0 Hz | Unlimited |
| | 51,0 Hz-51,5 Hz | To be specified by each TSO, but not less than 30 minutes |

2. With regard to the limited frequency sensitive mode — overfrequency (LFSM-O), the following shall apply, as determined by the relevant TSO for its control area in coordination with the TSOs of the same synchronous area to ensure minimal impacts on neighbouring areas:

(a) the power-generating module shall be capable of activating the provision of active power frequency response according to figure 1 at a frequency threshold and droop settings specified by the relevant TSO;

(b) instead of the capability referred to in paragraph (a), the relevant TSO may choose to allow within its control area automatic disconnection and reconnection of power-generating modules of Type A at randomised frequencies, ideally uniformly distributed, above a frequency threshold, as determined by the relevant TSO where it is able to demonstrate to the relevant regulatory authority, and with the cooperation of power-generating facility owners, that this has a limited cross-border impact and maintains the same level of operational security in all system states;

(c) the frequency threshold shall be between 50,2 Hz and 50,5 Hz inclusive;

(d) the droop settings shall be between 2 % and 12 %;

(e) the power-generating module shall be capable of activating a power frequency response with an initial delay that is as short as possible. If that delay is greater than two seconds, the power-generating facility owner shall justify the delay, providing technical evidence to the relevant TSO;

(f) the relevant TSO may require that upon reaching minimum regulating level, the power-generating module be capable of either:

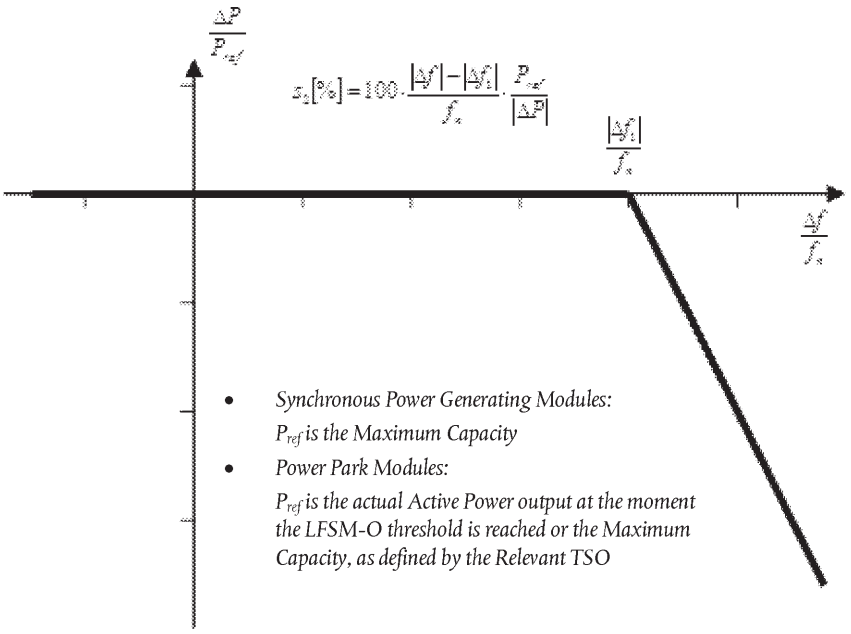
(i) continuing operation at this level; or

(ii) further decreasing active power output;

(g) the power-generating module shall be capable of operating stably during LFSM-O operation. When LFSM-O is active, the LFSM-O setpoint will prevail over any other active power setpoints.

*Figure 1*

**Active power frequency response capability of power-generating modules in LFSM-O**




$P_{ref}$ is the reference active power to which ΔP is related and may be specified differently for synchronous power-generating modules and power park modules. ΔP is the change in active power output from the power-generating module. $f_n$ is the nominal frequency (50 Hz) in the network and Δf is the frequency deviation in the network. At overfrequencies where Δf is above $\Delta f_1$, the power-generating module has to provide a negative active power output change according to the droop $S_2$.

3. The power-generating module shall be capable of maintaining constant output at its target active power value regardless of changes in frequency, except where output follows the changes specified in the context of paragraphs 2 and 4 of this Article or points (c) and (d) of Article 15(2) as applicable.

4. The relevant TSO shall specify admissible active power reduction from maximum output with falling frequency in its control area as a rate of reduction falling within the boundaries, illustrated by the full lines in Figure 2:

(a) below 49 Hz falling by a reduction rate of 2 % of the maximum capacity at 50 Hz per 1 Hz frequency drop;

(b) below 49,5 Hz falling by a reduction rate of 10 % of the maximum capacity at 50 Hz per 1 Hz frequency drop.

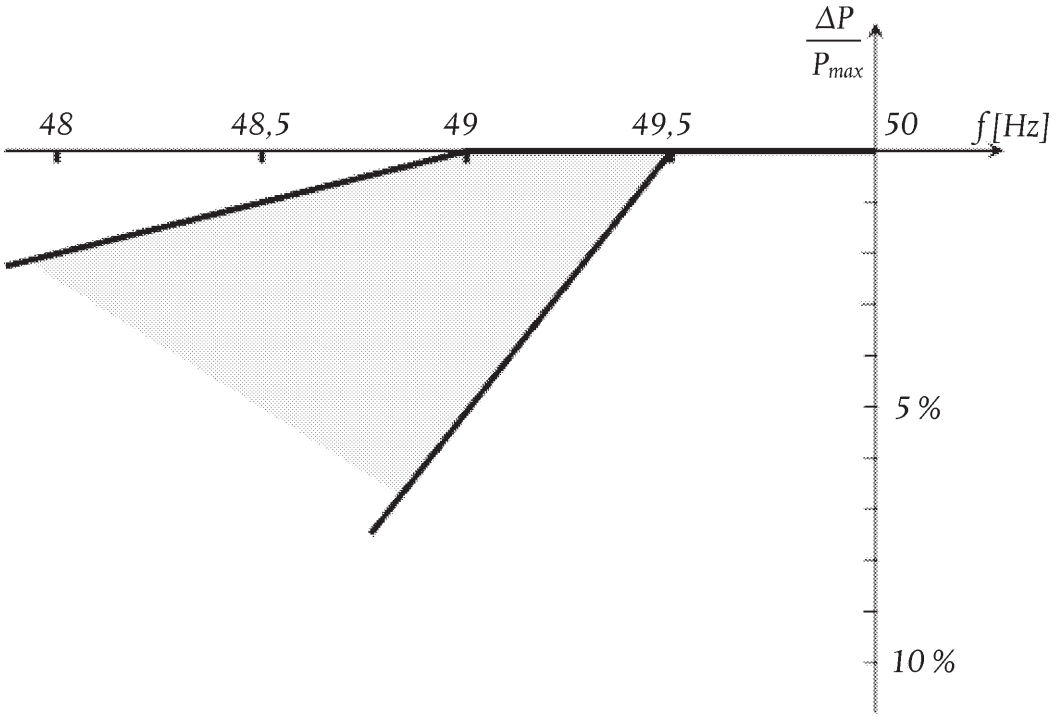
5. The admissible active power reduction from maximum output shall:

(a) clearly specify the ambient conditions applicable;

(b) take account of the technical capabilities of power-generating modules.

*Figure 2*

**Maximum power capability reduction with falling frequency**




The diagram represents the boundaries in which the capability can be specified by the relevant TSO.

6. The power-generating module shall be equipped with a logic interface (input port) in order to cease active power output within five seconds following an instruction being received at the input port. The relevant system operator shall have the right to specify requirements for equipment to make this facility operable remotely.

7. The relevant TSO shall specify the conditions under which a power-generating module is capable of connecting automatically to the network. Those conditions shall include:

(a) frequency ranges within which an automatic connection is admissible, and a corresponding delay time; and

(b) maximum admissible gradient of increase in active power output.

Automatic connection is allowed unless specified otherwise by the relevant system operator in coordination with the relevant TSO.

*Article 14*

**General requirements for type B power-generating modules**

1. Type B power-generating modules shall fulfil the requirements set out in Article 13, except for Article 13(2)(b).

2. Type B power-generating modules shall fulfil the following requirements in relation to frequency stability:

(a) to control active power output, the power-generating module shall be equipped with an interface (input port) in order to be able to reduce active power output following an instruction at the input port; and

(b) the relevant system operator shall have the right to specify the requirements for further equipment to allow active power output to be remotely operated.

3. Type B power-generating modules shall fulfil the following requirements in relation to robustness:

(a) with regard to fault-ride-through capability of power-generating modules:

(i) each TSO shall specify a voltage-against-time-profile in line with Figure 3 at the connection point for fault conditions, which describes the conditions in which the power-generating module is capable of staying connected to the network and continuing to operate stably after the power system has been disturbed by secured faults on the transmission system;

(ii) the voltage-against-time-profile shall express a lower limit of the actual course of the phase-to-phase voltages on the network voltage level at the connection point during a symmetrical fault, as a function of time before, during and after the fault;

(iii) the lower limit referred to in point (ii) shall be specified by the relevant TSO using the parameters set out in Figure 3, and within the ranges set out in Tables 3.1 and 3.2;

(iv) each TSO shall specify and make publicly available the pre-fault and post-fault conditions for the fault-ride-through capability in terms of:

— the calculation of the pre-fault minimum short circuit capacity at the connection point,

— pre-fault active and reactive power operating point of the power-generating module at the connection point and voltage at the connection point, and

— calculation of the post-fault minimum short circuit capacity at the connection point;

(v) at the request of a power-generating facility owner, the relevant system operator shall provide the pre-fault and post-fault conditions to be considered for fault-ride-through capability as an outcome of the calculations at the connection point as specified in point (iv) regarding:

— pre-fault minimum short circuit capacity at each connection point expressed in MVA,

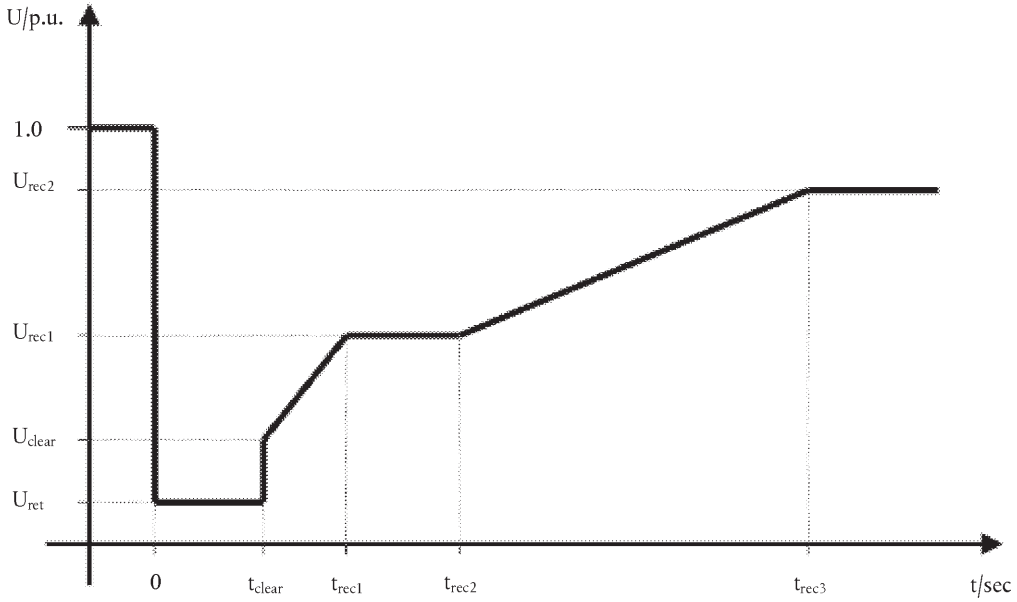
— pre-fault operating point of the power-generating module expressed in active power output and reactive power output at the connection point and voltage at the connection point, and

— post-fault minimum short circuit capacity at each connection point expressed in MVA.

Alternatively, the relevant system operator may provide generic values derived from typical cases;

*Figure 3*

**Fault-ride-through profile of a power-generating module**




The diagram represents the lower limit of a voltage-against-time profile of the voltage at the connection point, expressed as the ratio of its actual value and its reference 1 pu value before, during and after a fault. $U_{ret}$ is the retained voltage at the connection point during a fault, $t_{clear}$ is the instant when the fault has been cleared. $U_{rec1}$, $U_{rec2}$, $t_{rec1}$, $t_{rec2}$ and $t_{rec3}$ specify certain points of lower limits of voltage recovery after fault clearance.

*Table 3.1*

**Parameters for Figure 3 for fault-ride-through capability of synchronous power-generating modules**

| Voltage parameters (pu) | | Time parameters (seconds) | |
|---|---|---|---|
| $U_{ret}$: | 0,05-0,3 | $t_{clear}$: | 0,14-0,15 (or 0,14-0,25 if system protection and secure operation so require) |
| $U_{clear}$: | 0,7-0,9 | $t_{rec1}$: | $t_{clear}$ |
| $U_{rec1}$: | $U_{clear}$ | $t_{rec2}$: | $t_{rec1}$-0,7 |
| $U_{rec2}$: | 0,85-0,9 and ≥ $U_{clear}$ | $t_{rec3}$: | $t_{rec2}$-1,5 |

*Table 3.2*

**Parameters for Figure 3 for fault-ride-through capability of power park modules**

| Voltage parameters (pu) | | Time parameters (seconds) | |
|---|---|---|---|
| $U_{ret}$: | 0,05-0,15 | $t_{clear}$: | 0,14-0,15 (or 0,14-0,25 if system protection and secure operation so require) |
| $U_{clear}$: | $U_{ret}$-0,15 | $t_{rec1}$: | $t_{clear}$ |
| $U_{rec1}$: | $U_{clear}$ | $t_{rec2}$: | $t_{rec1}$ |
| $U_{rec2}$: | 0,85 | $t_{rec3}$: | 1,5-3,0 |

(vi) the power-generating module shall be capable of remaining connected to the network and continuing to operate stably when the actual course of the phase-to-phase voltages on the network voltage level at the connection point during a symmetrical fault, given the pre-fault and post-fault conditions in points (iv) and (v) of paragraph 3(a), remain above the lower limit specified in point (ii) of paragraph 3(a), unless the protection scheme for internal electrical faults requires the disconnection of the power-generating module from the network. The protection schemes and settings for internal electrical faults must not jeopardise fault-ride-through performance;

(vii) without prejudice to point (vi) of paragraph 3(a), undervoltage protection (either fault-ride-through capability or minimum voltage specified at the connection point voltage) shall be set by the power-generating facility owner according to the widest possible technical capability of the power-generating module, unless the relevant system operator requires narrower settings in accordance with point (b) of paragraph 5. The settings shall be justified by the power-generating facility owner in accordance with this principle;

(b) fault-ride-through capabilities in case of asymmetrical faults shall be specified by each TSO.

4. Type B power-generating modules shall fulfil the following requirements relating to system restoration:

(a) the relevant TSO shall specify the conditions under which a power-generating module is capable of reconnecting to the network after an incidental disconnection caused by a network disturbance; and

(b) installation of automatic reconnection systems shall be subject both to prior authorisation by the relevant system operator and to the reconnection conditions specified by the relevant TSO.

5. Type B power-generating modules shall fulfil the following general system management requirements:

(a) with regard to control schemes and settings:

(i) the schemes and settings of the different control devices of the power-generating module that are necessary for transmission system stability and for taking emergency action shall be coordinated and agreed between the relevant TSO, the relevant system operator and the power-generating facility owner;

(ii) any changes to the schemes and settings, mentioned in point (i), of the different control devices of the power-generating module shall be coordinated and agreed between the relevant TSO, the relevant system operator and the power-generating facility owner, in particular if they apply in the circumstances referred to in point (i) of paragraph 5(a);

(b) with regard to electrical protection schemes and settings:

(i) the relevant system operator shall specify the schemes and settings necessary to protect the network, taking into account the characteristics of the power-generating module. The protection schemes needed for the power-generating module and the network as well as the settings relevant to the power-generating module shall be coordinated and agreed between the relevant system operator and the power-generating facility owner. The protection schemes and settings for internal electrical faults must not jeopardise the performance of a power-generating module, in line with the requirements set out in this Regulation;

(ii) electrical protection of the power-generating module shall take precedence over operational controls, taking into account the security of the system and the health and safety of staff and of the public, as well as mitigating any damage to the power-generating module;

(iii) protection schemes may cover the following aspects:

— external and internal short circuit,

— asymmetric load (negative phase sequence),

— stator and rotor overload,

— over-/underexcitation,

— over-/undervoltage at the connection point,

— over-/undervoltage at the alternator terminals,

— inter-area oscillations,

— inrush current,

— asynchronous operation (pole slip),

— protection against inadmissible shaft torsions (for example, subsynchronous resonance),

— power-generating module line protection,

— unit transformer protection,

— back-up against protection and switchgear malfunction,

— overfluxing (U/f),

— inverse power,

— rate of change of frequency, and

— neutral voltage displacement.

(iv) changes to the protection schemes needed for the power-generating module and the network and to the settings relevant to the power-generating module shall be agreed between the system operator and the power-generating facility owner, and agreement shall be reached before any changes are made;

(c) the power-generating facility owner shall organise its protection and control devices in accordance with the following priority ranking (from highest to lowest):

(i) network and power-generating module protection;

(ii) synthetic inertia, if applicable;

(iii) frequency control (active power adjustment);

(iv) power restriction; and

(v) power gradient constraint;

(d) with regard to information exchange:

(i) power-generating facilities shall be capable of exchanging information with the relevant system operator or the relevant TSO in real time or periodically with time stamping, as specified by the relevant system operator or the relevant TSO;

(ii) the relevant system operator, in coordination with the relevant TSO, shall specify the content of information exchanges including a precise list of data to be provided by the power-generating facility.

*Article 15*

**General requirements for type C power-generating modules**

1. Type C power-generating modules shall fulfil the requirements laid down in Articles 13 and 14, except for Article 13(2)(b) and (6) and Article 14(2).

2. Type C power-generating modules shall fulfil the following requirements relating to frequency stability:

(a) with regard to active power controllability and control range, the power-generating module control system shall be capable of adjusting an active power setpoint in line with instructions given to the power-generating facility owner by the relevant system operator or the relevant TSO.

The relevant system operator or the relevant TSO shall establish the period within which the adjusted active power setpoint must be reached. The relevant TSO shall specify a tolerance (subject to the availability of the prime mover resource) applying to the new setpoint and the time within which it must be reached;

(b) manual local measures shall be allowed in cases where the automatic remote control devices are out of service.

The relevant system operator or the relevant TSO shall notify the regulatory authority of the time required to reach the setpoint together with the tolerance for the active power;

(c) In addition to Article 13(2), the following requirements shall apply to type C power-generating modules with regard to limited frequency sensitive mode — underfrequency (LFSM-U):

(i) the power-generating module shall be capable of activating the provision of active power frequency response at a frequency threshold and with a droop specified by the relevant TSO in coordination with the TSOs of the same synchronous area as follows:

— the frequency threshold specified by the TSO shall be between 49,8 Hz and 49,5 Hz inclusive,

— the droop settings specified by the TSO shall be in the range 2-12 %.

This is represented graphically in Figure 4;

(ii) the actual delivery of active power frequency response in LFSM-U mode shall take into account:

— ambient conditions when the response is to be triggered,

— the operating conditions of the power-generating module, in particular limitations on operation near maximum capacity at low frequencies and the respective impact of ambient conditions according to paragraphs 4 and 5 of Article 13, and

— the availability of the primary energy sources.

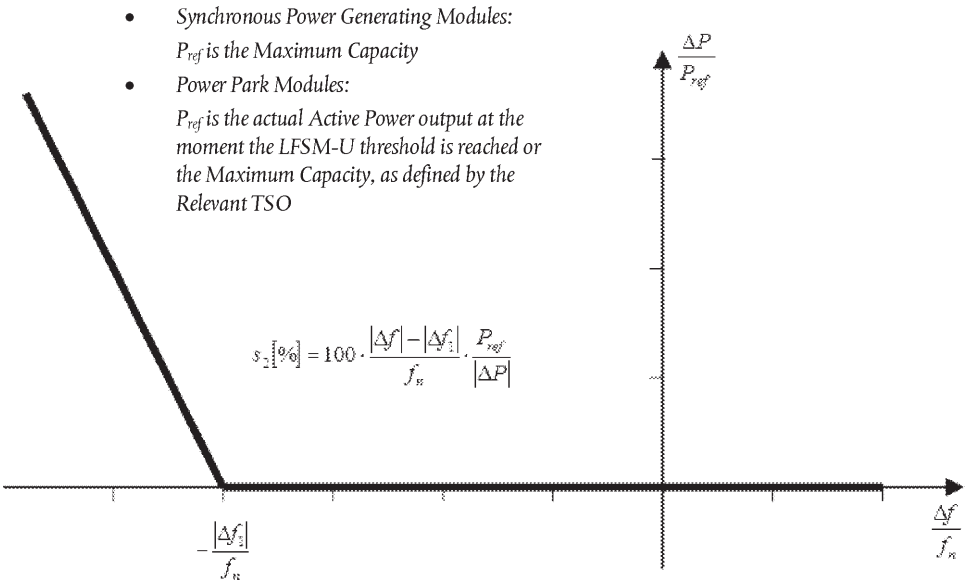
(iii) the activation of active power frequency response by the power-generating module shall not be unduly delayed. In the event of any delay greater than two seconds, the power-generating facility owner shall justify it to the relevant TSO;

(iv) in LFSM-U mode the power-generating module shall be capable of providing a power increase up to its maximum capacity;

(v) stable operation of the power-generating module during LFSM-U operation shall be ensured;

*Figure 4*

**Active power frequency response capability of power-generating modules in LFSM-U**




$P_{ref}$ is the reference active power to which ΔP is related and may be specified differently for synchronous power-generating modules and power park modules. ΔP is the change in active power output from the power-generating module. $f_n$ is the nominal frequency (50 Hz) in the network and Δf is the frequency deviation in the network. At underfrequencies where Δf is below $\Delta f_1$ the power-generating module has to provide a positive active power output change according to the droop $S_2$.

(d) in addition to point (c) of paragraph 2, the following shall apply cumulatively when frequency sensitive mode ('FSM') is operating:

(i) the power-generating module shall be capable of providing active power frequency response in accordance with the parameters specified by each relevant TSO within the ranges shown in Table 4. In specifying those parameters, the relevant TSO shall take account of the following facts:

— in case of overfrequency, the active power frequency response is limited by the minimum regulating level,

— in case of underfrequency, the active power frequency response is limited by maximum capacity,

— the actual delivery of active power frequency response depends on the operating and ambient conditions of the power-generating module when this response is triggered, in particular limitations on operation near maximum capacity at low frequencies according to paragraphs 4 and 5 of Article 13 and available primary energy sources;

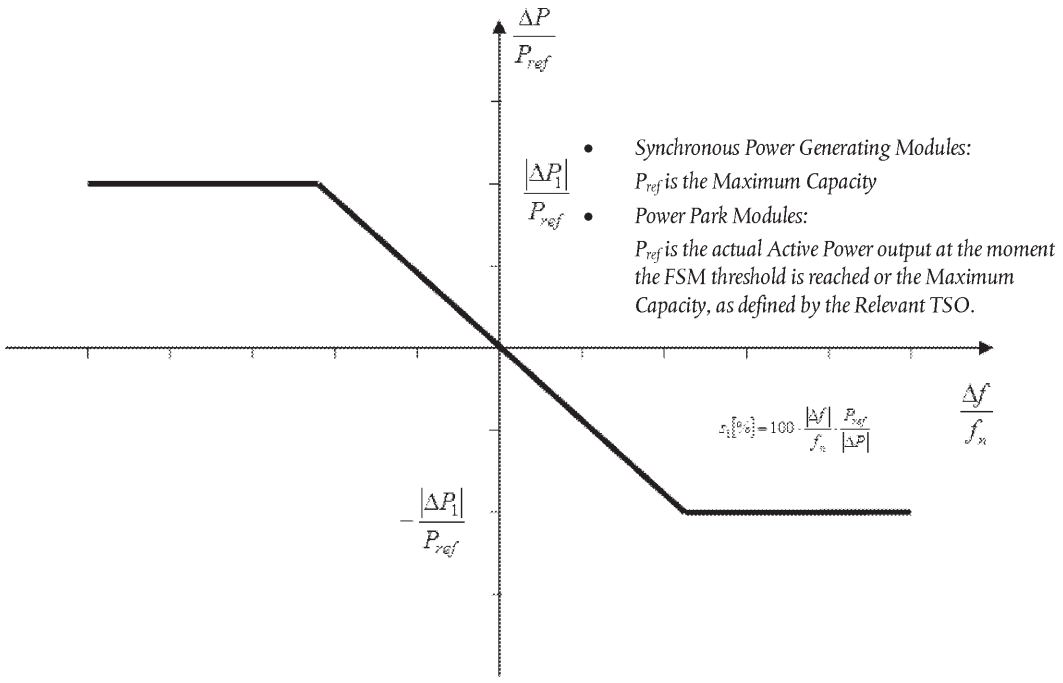
*Table 4*

**Parameters for active power frequency response in FSM (explanation for Figure 5)**

| Parameters | | Ranges |
|---|---|---|
| Active power range related to maximum capacity $\frac{\lvert\Delta P_1\rvert}{P_{max}}$ | | 1,5-10 % |
| Frequency response insensitivity | $\lvert\Delta f_i\rvert$ | 10-30 mHz |
| | $\frac{\lvert\Delta f_i\rvert}{f_n}$ | 0,02-0,06 % |
| Frequency response deadband | | 0-500 mHz |
| Droop $s_1$ | | 2-12 % |

*Figure 5*

**Active power frequency response capability of power-generating modules in FSM illustrating the case of zero deadband and insensitivity**



$P_{ref}$ is the reference active power to which ΔP is related. ΔP is the change in active power output from the power-generating module. $f_n$ is the nominal frequency (50 Hz) in the network and Δf is the frequency deviation in the network.

(ii) the frequency response deadband of frequency deviation and droop must be able to be reselected repeatedly;

(iii) in the event of a frequency step change, the power-generating module shall be capable of activating full active power frequency response, at or above the full line shown in Figure 6 in accordance with the parameters specified by each TSO (which shall aim at avoiding active power oscillations for the power-generating module) within the ranges given in Table 5. The combination of choice of the parameters specified by the TSO shall take possible technology-dependent limitations into account;

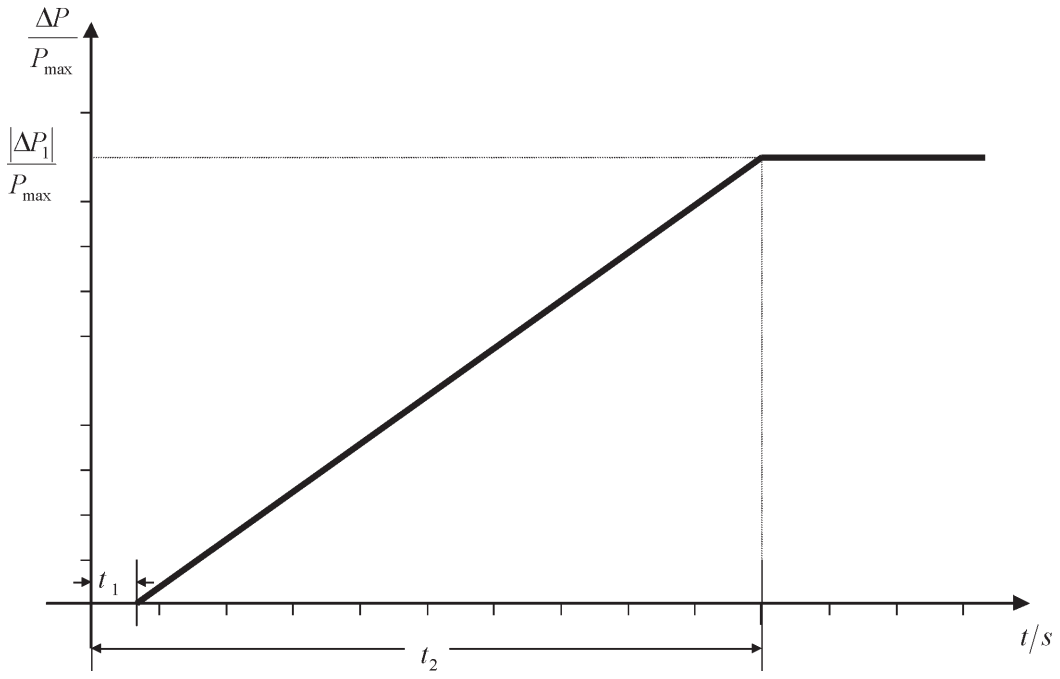
(iv) the initial activation of active power frequency response required shall not be unduly delayed.

If the delay in initial activation of active power frequency response is greater than two seconds, the power-generating facility owner shall provide technical evidence demonstrating why a longer time is needed.

For power-generating modules without inertia, the relevant TSO may specify a shorter time than two seconds. If the power-generating facility owner cannot meet this requirement they shall provide technical evidence demonstrating why a longer time is needed for the initial activation of active power frequency response;

*Figure 6*

**Active power frequency response capability**




$P_{max}$ is the maximum capacity to which ΔP relates. ΔP is the change in active power output from the power-generating module. The power-generating module has to provide active power output ΔP up to the point $\Delta P_1$ in accordance with the times $t_1$ and $t_2$ with the values of $\Delta P_1$, $t_1$and $t_2$ being specified by the relevant TSO according to Table 5. $t_1$ is the initial delay. $t_2$ is the time for full activation.

(v) the power-generating module shall be capable of providing full active power frequency response for a period of between 15 and 30 minutes as specified by the relevant TSO. In specifying the period, the TSO shall have regard to active power headroom and primary energy source of the power-generating module;

(vi) within the time limits laid down in point (v) of paragraph 2(d), active power control must not have any adverse impact on the active power frequency response of power-generating modules;

(vii) the parameters specified by the relevant TSO in accordance with points (i), (ii), (iii) and (v) shall be notified to the relevant regulatory authority. The modalities of that notification shall be specified in accordance with the applicable national regulatory framework;

*Table 5*

**Parameters for full activation of active power frequency response resulting from frequency step change (explanation for Figure 6)**

| Parameters | Ranges or values |
|---|---|
| Active power range related to maximum capacity (frequency response range) $\frac{\lvert\Delta P_1\rvert}{P_{max}}$ | 1,5-10 % |
| For power-generating modules with inertia, the maximum admissible initial delay $t_1$ unless justified otherwise in line with Article 15(2)(d)(iv) | 2 seconds |
| For power-generating modules without inertia, the maximum admissible initial delay $t_1$ unless justified otherwise in line with Article 15(2)(d)(iv) | as specified by the relevant TSO. |
| Maximum admissible choice of full activation time $t_2$, unless longer activation times are allowed by the relevant TSO for reasons of system stability | 30 seconds |

(e) with regard to frequency restoration control, the power-generating module shall provide functionalities complying with specifications specified by the relevant TSO, aiming at restoring frequency to its nominal value or maintaining power exchange flows between control areas at their scheduled values;

(f) with regard to disconnection due to underfrequency, power-generating facilities capable of acting as a load, including hydro pump-storage power-generating facilities, shall be capable of disconnecting their load in case of underfrequency. The requirement referred to in this point does not extend to auxiliary supply;

(g) with regard to real-time monitoring of FSM:

(i) to monitor the operation of active power frequency response, the communication interface shall be equipped to transfer in real time and in a secured manner from the power-generating facility to the network control centre of the relevant system operator or the relevant TSO, at the request of the relevant system operator or the relevant TSO, at least the following signals:

— status signal of FSM (on/off),

— scheduled active power output,

— actual value of the active power output,

— actual parameter settings for active power frequency response,

— droop and deadband;

(ii) the relevant system operator and the relevant TSO shall specify additional signals to be provided by the power-generating facility by monitoring and recording devices in order to verify the performance of the active power frequency response provision of participating power-generating modules.

3. With regard to voltage stability, type C power-generating modules shall be capable of automatic disconnection when voltage at the connection point reaches levels specified by the relevant system operator in coordination with the relevant TSO.

The terms and settings for actual automatic disconnection of power-generating modules shall be specified by the relevant system operator in coordination with the relevant TSO.

4. Type C power-generating modules shall fulfil the following requirements relating to robustness:

(a) in the event of power oscillations, power-generating modules shall retain steady-state stability when operating at any operating point of the P-Q-capability diagram;

(b) without prejudice to paragraph 4 and 5 of Article 13, power-generating modules shall be capable of remaining connected to the network and operating without power reduction, as long as voltage and frequency remain within the specified limits pursuant to this Regulation;

(c) power-generating modules shall be capable of remaining connected to the network during single-phase or three-phase auto-reclosures on meshed network lines, if applicable to the network to which they are connected. The details of that capability shall be subject to coordination and agreements on protection schemes and settings as referred to in point (b) of Article 14(5).

5. Type C power-generating modules shall fulfil the following requirements relating to system restoration:

(a) with regard to black start capability:

(i) black start capability is not mandatory without prejudice to the Member State's rights to introduce obligatory rules in order to ensure system security;

(ii) power-generating facility owners shall, at the request of the relevant TSO, provide a quotation for providing black start capability. The relevant TSO may make such a request if it considers system security to be at risk due to a lack of black start capability in its control area;

(iii) a power-generating module with black start capability shall be capable of starting from shutdown without any external electrical energy supply within a time frame specified by the relevant system operator in coordination with the relevant TSO;

(iv) a power-generating module with black start capability shall be able to synchronise within the frequency limits laid down in point (a) of Article 13(1) and, where applicable, voltage limits specified by the relevant system operator or in Article 16(2);

(v) a power-generating module with black start capability shall be capable of automatically regulating dips in voltage caused by connection of demand;

(vi) a power-generating module with black start capability shall:

— be capable of regulating load connections in block load,

— be capable of operating in LFSM-O and LFSM-U, as specified in point (c) of paragraph 2 and Article 13(2),

— control frequency in case of overfrequency and underfrequency within the whole active power output range between minimum regulating level and maximum capacity as well as at houseload level,

— be capable of parallel operation of a few power-generating modules within one island, and

— control voltage automatically during the system restoration phase;

(b) with regard to the capability to take part in island operation:

(i) power-generating modules shall be capable of taking part in island operation if required by the relevant system operator in coordination with the relevant TSO and:

— the frequency limits for island operation shall be those established in accordance with point (a) of Article 13(1),

— the voltage limits for island operation shall be those established in accordance with Article 15(3) or Article 16(2), where applicable;

(ii) power-generating modules shall be able to operate in FSM during island operation, as specified in point (d) of paragraph 2.

In the event of a power surplus, power-generating modules shall be capable of reducing the active power output from a previous operating point to any new operating point within the P-Q-capability diagram. In that regard, the power-generating module shall be capable of reducing active power output as much as inherently technically feasible, but to at least 55 % of its maximum capacity;

(iii) the method for detecting a change from interconnected system operation to island operation shall be agreed between the power-generating facility owner and the relevant system operator in coordination with the relevant TSO. The agreed method of detection must not rely solely on the system operator's switchgear position signals;

(iv) power-generating modules shall be able to operate in LFSM-O and LFSM-U during island operation, as specified in point (c) of paragraph 2 and Article 13(2);

(c) with regard to quick re-synchronisation capability:

(i) in case of disconnection of the power-generating module from the network, the power-generating module shall be capable of quick re-synchronisation in line with the protection strategy agreed between the relevant system operator in coordination with the relevant TSO and the power-generating facility;

(ii) a power-generating module with a minimum re-synchronisation time greater than 15 minutes after its disconnection from any external power supply must be designed to trip to houseload from any operating point in its P-Q-capability diagram. In this case, the identification of houseload operation must not be based solely on the system operator's switchgear position signals;

(iii) power-generating modules shall be capable of continuing operation following tripping to houseload, irrespective of any auxiliary connection to the external network. The minimum operation time shall be specified by the relevant system operator in coordination with the relevant TSO, taking into consideration the specific characteristics of prime mover technology.

6. Type C power-generating modules shall fulfil the following general system management requirements:

(a) with regard to loss of angular stability or loss of control, a power-generating module shall be capable of disconnecting automatically from the network in order to help preserve system security or to prevent damage to the power-generating module. The power-generating facility owner and the relevant system operator in coordination with the relevant TSO shall agree on the criteria for detecting loss of angular stability or loss of control;

(b) with regard to instrumentation:

(i) power-generating facilities shall be equipped with a facility to provide fault recording and monitoring of dynamic system behaviour. This facility shall record the following parameters:

— voltage,

— active power,

— reactive power, and

— frequency.

The relevant system operator shall have the right to specify quality of supply parameters to be complied with on condition that reasonable prior notice is given;

(ii) the settings of the fault recording equipment, including triggering criteria and the sampling rates shall be agreed between the power-generating facility owner and the relevant system operator in coordination with the relevant TSO;

(iii) the dynamic system behaviour monitoring shall include an oscillation trigger specified by the relevant system operator in coordination with the relevant TSO, with the purpose of detecting poorly damped power oscillations;

(iv) the facilities for quality of supply and dynamic system behaviour monitoring shall include arrangements for the power-generating facility owner, and the relevant system operator and the relevant TSO to access the information. The communications protocols for recorded data shall be agreed between the power-generating facility owner, the relevant system operator and the relevant TSO;

(c) with regard to the simulation models:

(i) at the request of the relevant system operator or the relevant TSO, the power-generating facility owner shall provide simulation models which properly reflect the behaviour of the power-generating module in both steady-state and dynamic simulations (50 Hz component) or in electromagnetic transient simulations.

The power-generating facility owner shall ensure that the models provided have been verified against the results of compliance tests referred to in Chapters 2, 3 and 4 of Title IV, and shall notify the results of the verification to the relevant system operator or relevant TSO. Member States may require that such verification be carried out by an authorised certifier;

(ii) the models provided by the power-generating facility owner shall contain the following sub-models, depending on the existence of the individual components:

— alternator and prime mover,

— speed and power control,

— voltage control, including, if applicable, power system stabiliser ('PSS') function and excitation control system,

— power-generating module protection models, as agreed between the relevant system operator and the power-generating facility owner, and

— converter models for power park modules;

(iii) the request by the relevant system operator referred to in point (i) shall be coordinated with the relevant TSO. It shall include:

— the format in which models are to be provided,

— the provision of documentation on a model's structure and block diagrams,

— an estimate of the minimum and maximum short circuit capacity at the connection point, expressed in MVA, as an equivalent of the network;

(iv) the power-generating facility owner shall provide recordings of the power-generating module's performance to the relevant system operator or relevant TSO if requested. The relevant system operator or relevant TSO may make such a request, in order to compare the response of the models with those recordings;

(d) with regard to the installation of devices for system operation and devices for system security, if the relevant system operator or the relevant TSO considers that it is necessary to install additional devices in a power-generating facility in order to preserve or restore system operation or security, the relevant system operator or relevant TSO and the power-generating facility owner shall investigate that matter and agree on an appropriate solution;

(e) the relevant system operator shall specify, in coordination with the relevant TSO, minimum and maximum limits on rates of change of active power output (ramping limits) in both an up and down direction of change of active power output for a power-generating module, taking into consideration the specific characteristics of prime mover technology;

(f) earthing arrangement of the neutral-point at the network side of step-up transformers shall comply with the specifications of the relevant system operator.

*Article 16*

**General requirements for type D power-generating modules**

1. In addition to fulfilling the requirements listed in Article 13, except for Article 13(2)(b), (6) and (7), Article 14, except for Article 14(2), and Article 15, except for Article 15(3), type D power-generating modules shall fulfil the requirements set out in this Article.

2. Type D power-generating modules shall fulfil the following requirements relating to voltage stability:

(a) with regard to voltage ranges:

(i) without prejudice to point (a) of Article 14(3) and point (a) of paragraph 3 below, a power-generating module shall be capable of staying connected to the network and operating within the ranges of the network voltage at the connection point, expressed by the voltage at the connection point related to the reference 1 pu voltage, and for the time periods specified in Tables 6.1 and 6.2;

(ii) the relevant TSO may specify shorter periods of time during which power-generating modules shall be capable of remaining connected to the network in the event of simultaneous overvoltage and underfrequency or simultaneous undervoltage and overfrequency;

(iii) notwithstanding the provisions of point (i), the relevant TSO in Spain may require power-generating modules to be capable of remaining connected to the network in the voltage range between 1,05 pu and 1,0875 pu for an unlimited period;

(iv) for the 400 kV grid voltage level (or alternatively commonly referred to as 380 kV level), the reference 1 pu value is 400 kV; for other grid voltage levels, the reference 1 pu voltage may differ for each system operator in the same synchronous area;

(v) notwithstanding the provisions of point (i), the relevant TSOs in the Baltic synchronous area may require power-generating modules to remain connected to the 400 kV network in the voltage range limits and for the time periods that apply in the Continental Europe synchronous area;

*Table 6.1*

| Synchronous area | Voltage range | Time period for operation |
|---|---|---|
| Continental Europe | 0,85 pu-0,90 pu | 60 minutes |
| | 0,90 pu-1,118 pu | Unlimited |
| | 1,118 pu-1,15 pu | To be specified by each TSO, but not less than 20 minutes and not more than 60 minutes |
| Nordic | 0,90 pu-1,05 pu | Unlimited |
| | 1,05 pu-1,10 pu | 60 minutes |
| Great Britain | 0,90 pu-1,10 pu | Unlimited |
| Ireland and Northern Ireland | 0,90 pu-1,118 pu | Unlimited |
| Baltic | 0,85 pu-0,90 pu | 30 minutes |
| | 0,90 pu-1,118 pu | Unlimited |
| | 1,118 pu-1,15 pu | 20 minutes |

The table shows the minimum time periods during which a power-generating module must be capable of operating for voltages deviating from the reference 1 pu value at the connection point without disconnecting from the network, where the voltage base for pu values is from 110 kV to 300 kV.

*Table 6.2*

| Synchronous area | Voltage range | Time period for operation |
|---|---|---|
| Continental Europe | 0,85 pu-0,90 pu | 60 minutes |
| | 0,90 pu-1,05 pu | Unlimited |
| | 1,05 pu-1,10 pu | To be specified by each TSO, but not less than 20 minutes and not more than 60 minutes |
| Nordic | 0,90 pu-1,05 pu | Unlimited |
| | 1,05 pu-1,10 pu | To be specified by each TSO, but not more than 60 minutes |
| Great Britain | 0,90 pu-1,05 pu | Unlimited |
| | 1,05 pu-1,10 pu | 15 minutes |
| Ireland and Northern Ireland | 0,90 pu-1,05 pu | Unlimited |
| Baltic | 0,88 pu-0,90 pu | 20 minutes |
| | 0,90 pu-1,097 pu | Unlimited |
| | 1,097 pu-1,15 pu | 20 minutes |

The table shows the minimum time periods during which a power-generating module must be capable of operating for voltages deviating from the reference 1 pu value at the connection point without disconnecting from the network where the voltage base for pu values is from 300 kV to 400 kV.

(b) wider voltage ranges or longer minimum time periods for operation may be agreed between the relevant system operator and the power-generating facility owner in coordination with the relevant TSO. If wider voltage ranges or longer minimum times for operation are economically and technically feasible, the power-generating facility owner shall not unreasonably withhold an agreement;

(c) without prejudice to point (a), the relevant system operator in coordination with the relevant TSO shall have the right to specify voltages at the connection point at which a power-generating module is capable of automatic disconnection. The terms and settings for automatic disconnection shall be agreed between the relevant system operator and the power-generating facility owner.

3. Type D power-generating modules shall fulfil the following requirements in relation to robustness:

(a) with regard to fault-ride-through capability:

(i) power-generating modules shall be capable of staying connected to the network and continuing to operate stably after the power system has been disturbed by secured faults. That capability shall be in accordance with a voltage-against-time profile at the connection point for fault conditions specified by the relevant TSO.

The voltage-against-time-profile shall express a lower limit of the actual course of the phase-to-phase voltages on the network voltage level at the connection point during a symmetrical fault, as a function of time before, during and after the fault.

That lower limit shall be specified by the relevant TSO, using the parameters set out in Figure 3 and within the ranges set out in Tables 7.1 and 7.2 for type D power-generating modules connected at or above the 110 kV level.

That lower limit shall also be specified by the relevant TSO, using parameters set out in Figure 3 and within the ranges set out in Tables 3.1 and 3.2 for type D power-generating modules connected below the 110 kV level;

(ii) each TSO shall specify the pre-fault and post-fault conditions for the fault-ride-through capability referred to in point (iv) of Article 14(3)(a). The specified pre-fault and post-fault conditions for the fault-ride-through capability shall be made publicly available;

*Table 7.1*

**Parameters for Figure 3 for fault-ride-through capability of synchronous power-generating modules**

| Voltage parameters (pu) | | Time parameters (seconds) | |
|---|---|---|---|
| $U_{ret}$: | 0 | $t_{clear}$: | 0,14-0,15 (or 0,14-0,25 if system protection and secure operation so require) |
| $U_{clear}$: | 0,25 | $t_{rec1}$: | $t_{clear}$-0,45 |
| $U_{rec1}$: | 0,5-0,7 | $t_{rec2}$: | $t_{rec1}$-0,7 |
| $U_{rec2}$: | 0,85-0,9 | $t_{rec3}$: | $t_{rec2}$-1,5 |

*Table 7.2*

**Parameters for Figure 3 for fault-ride-through capability of power park modules**

| Voltage parameters (pu) | | Time parameters (seconds) | |
|---|---|---|---|
| $U_{ret}$: | 0 | $t_{clear}$: | 0,14-0,15 (or 0,14-0,25 if system protection and secure operation so require) |
| $U_{clear}$: | $U_{ret}$ | $t_{rec1}$: | $t_{clear}$ |
| $U_{rec1}$: | $U_{clear}$ | $t_{rec2}$: | $t_{rec1}$ |
| $U_{rec2}$: | 0,85 | $t_{rec3}$: | 1,5-3,0 |

(b) at the request of a power-generating facility owner, the relevant system operator shall provide the pre-fault and post-fault conditions to be considered for fault-ride-through capability as an outcome of the calculations at the connection point as specified in point (iv) of Article 14(3)(a) regarding:

(i) pre-fault minimum short circuit capacity at each connection point expressed in MVA;

(ii) pre-fault operating point of the power-generating module expressed as active power output and reactive power output at the connection point and voltage at the connection point; and

(iii) post-fault minimum short circuit capacity at each connection point expressed in MVA;

(c) fault-ride-through capabilities in case of asymmetrical faults shall be specified by each TSO.

4. Type D power-generating modules shall fulfil the following general system management requirements:

(a) with regard to synchronisation, when starting a power-generating module, synchronisation shall be performed by the power-generating facility owner only after authorisation by the relevant system operator;

(b) the power-generating module shall be equipped with the necessary synchronisation facilities;

(c) synchronisation of power-generating modules shall be possible at frequencies within the ranges set out in Table 2;

(d) the relevant system operator and the power-generating facility owner shall agree on the settings of synchronisation devices to be concluded prior to operation of the power-generating module. This agreement shall cover:

(i) voltage;

(ii) frequency;

(iii) phase angle range;

(iv) phase sequence;

(v) deviation of voltage and frequency.

*CHAPTER 2*

***Requirements for synchronous power-generating modules***

*Article 17*

**Requirements for type B synchronous power-generating modules**

1. Type B synchronous power-generating modules shall fulfil the requirements listed in Articles 13, except for Article 13(2)(b), and 14.

2. Type B synchronous power-generating modules shall fulfil the following additional requirements relating to voltage stability:

(a) with regard to reactive power capability, the relevant system operator shall have the right to specify the capability of a synchronous power-generating module to provide reactive power;

(b) with regard to the voltage control system, a synchronous power-generating module shall be equipped with a permanent automatic excitation control system that can provide constant alternator terminal voltage at a selectable setpoint without instability over the entire operating range of the synchronous power-generating module.

3. With regard to robustness, type B synchronous power-generating modules shall be capable of providing post-fault active power recovery. The relevant TSO shall specify the magnitude and time for active power recovery.

*Article 18*

**Requirements for type C synchronous power-generating modules**

1. Type C synchronous power-generating modules shall fulfil the requirements laid down in Articles 13, 14, 15 and 17, except for Article 13(2)(b) and 13(6), Article 14(2) and Article 17(2)(a).

2. Type C synchronous power-generating modules shall fulfil the following additional requirements in relation to voltage stability:

(a) with regard to reactive power capability, the relevant system operator may specify supplementary reactive power to be provided if the connection point of a synchronous power-generating module is neither located at the high-voltage terminals of the step-up transformer to the voltage level of the connection point nor at the alternator terminals, if no step-up transformer exists. This supplementary reactive power shall compensate the reactive power demand of the high-voltage line or cable between the high-voltage terminals of the step-up transformer of the synchronous power-generating module or its alternator terminals, if no step-up transformer exists, and the connection point and shall be provided by the responsible owner of that line or cable;

(b) with regard to reactive power capability at maximum capacity:

(i) the relevant system operator in coordination with the relevant TSO shall specify the reactive power provision capability requirements in the context of varying voltage. For that purpose the relevant system operator shall specify a U-Q/$P_{max}$-profile within the boundaries of which the synchronous power-generating module shall be capable of providing reactive power at its maximum capacity. The specified U-Q/$P_{max}$ profile may take any shape, having regard to the potential costs of delivering the capability to provide reactive power production at high voltages and reactive power consumption at low voltages;

(ii) the U-Q/$P_{max}$-profile shall be specified by the relevant system operator in coordination with the relevant TSO, in conformity with the following principles:

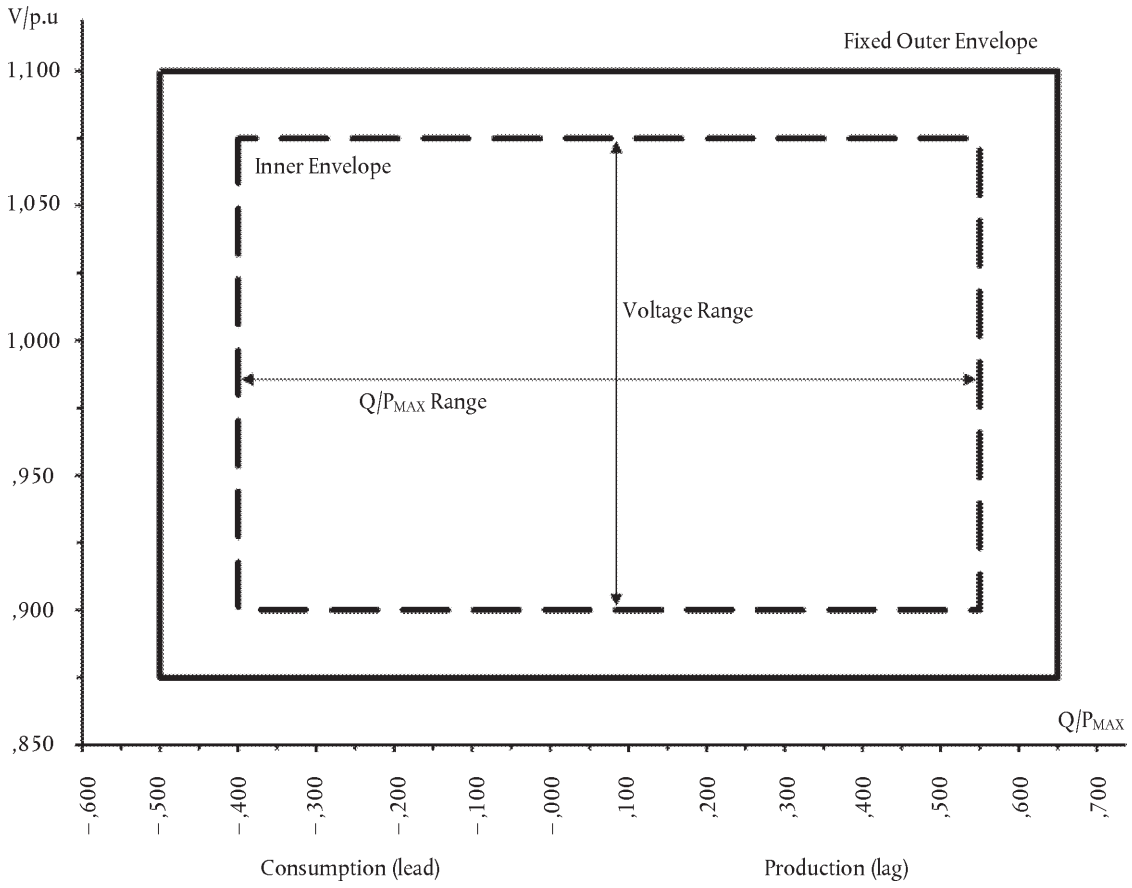
— the U-Q/$P_{max}$-profile shall not exceed the U-Q/$P_{max}$-profile envelope, represented by the inner envelope in Figure 7,

— the dimensions of the U-Q/$P_{max}$-profile envelope (Q/$P_{max}$ range and voltage range) shall be within the range specified for each synchronous area in Table 8, and

— the position of the U-Q/$P_{max}$-profile envelope shall be within the limits of the fixed outer envelope in Figure 7;

*Figure 7*

**U-Q/$P_{max}$-profile of a synchronous power-generating module**




The diagram represents boundaries of a U-Q/$P_{max}$-profile by the voltage at the connection point, expressed by the ratio of its actual value and the reference 1 pu value, against the ratio of the reactive power (Q) and the maximum capacity ($P_{max}$). The position, size and shape of the inner envelope are indicative.

*Table 8*

**Parameters for the inner envelope in Figure 7**

| Synchronous area | Maximum range of Q/$P_{max}$ | Maximum range of steady-state voltage level in PU |
|---|---|---|
| Continental Europe | 0,95 | 0,225 |
| Nordic | 0,95 | 0,150 |

| Synchronous area | Maximum range of $Q/P_{max}$ | Maximum range of steady-state voltage level in PU |
|---|---|---|
| Great Britain | 0,95 | 0,225 |
| Ireland and Northern Ireland | 1,08 | 0,218 |
| Baltic | 1,0 | 0,220 |

(iii) the reactive power provision capability requirement applies at the connection point. For profile shapes other than rectangular, the voltage range represents the highest and lowest values. The full reactive power range is therefore not expected to be available across the range of steady-state voltages;

(iv) the synchronous power-generating module shall be capable of moving to any operating point within its U-$Q/P_{max}$ profile in appropriate timescales to target values requested by the relevant system operator;

(c) with regard to reactive power capability below maximum capacity, when operating at an active power output below the maximum capacity ($P < P_{max}$), the synchronous power-generating modules shall be capable of operating at every possible operating point in the P-Q-capability diagram of the alternator of that synchronous power-generating module, at least down to minimum stable operating level. Even at reduced active power output, reactive power supply at the connection point shall correspond fully to the P-Q-capability diagram of the alternator of that synchronous power-generating module, taking the auxiliary supply power and the active and reactive power losses of the step-up transformer, if applicable, into account.

*Article 19*

**Requirements for type D synchronous power-generating modules**

1. Type D synchronous power-generating modules shall fulfil the requirements laid down in Article 13, except for Article 13(2)(b), (6) and (7), Article 14 except for Article 14(2), Article 15, except for Article 15(3), Article 16, Article 17, except for Article 17(2) and Article 18.

2. Type D synchronous power-generating modules shall fulfil the following additional requirements in relation to voltage stability:

(a) the parameters and settings of the components of the voltage control system shall be agreed between the power-generating facility owner and the relevant system operator, in coordination with the relevant TSO;

(b) the agreement referred to in subparagraph (a) shall cover the specifications and performance of an automatic voltage regulator ('AVR') with regard to steady-state voltage and transient voltage control and the specifications and performance of the excitation control system. The latter shall include:

(i) bandwidth limitation of the output signal to ensure that the highest frequency of response cannot excite torsional oscillations on other power-generating modules connected to the network;

(ii) an underexcitation limiter to prevent the AVR from reducing the alternator excitation to a level which would endanger synchronous stability;

(iii) an overexcitation limiter to ensure that the alternator excitation is not limited to less than the maximum value that can be achieved whilst ensuring that the synchronous power-generating module is operating within its design limits;

(iv) a stator current limiter; and

(v) a PSS function to attenuate power oscillations, if the synchronous power-generating module size is above a value of maximum capacity specified by the relevant TSO.

3. The relevant TSO and the power-generating facility owner shall enter into an agreement regarding technical capabilities of the power-generating module to aid angular stability under fault conditions.

*CHAPTER 3*

***Requirements for power park modules***

*Article 20*

**Requirements for type B power park modules**

1. Type B power park modules shall fulfil the requirements laid down in Articles 13, except for Article 13(2)(b), and Article 14.

2. Type B power park modules shall fulfil the following additional requirements in relation to voltage stability:

(a) with regard to reactive power capability, the relevant system operator shall have the right to specify the capability of a power park module to provide reactive power;

(b) the relevant system operator in coordination with the relevant TSO shall have the right to specify that a power park module be capable of providing fast fault current at the connection point in case of symmetrical (3-phase) faults, under the following conditions:

(i) the power park module shall be capable of activating the supply of fast fault current either by:

— ensuring the supply of the fast fault current at the connection point, or

— measuring voltage deviations at the terminals of the individual units of the power park module and providing a fast fault current at the terminals of these units;

(ii) the relevant system operator in coordination with the relevant TSO shall specify:

— how and when a voltage deviation is to be determined as well as the end of the voltage deviation,

— the characteristics of the fast fault current, including the time domain for measuring the voltage deviation and fast fault current, for which current and voltage may be measured differently from the method specified in Article 2,

— the timing and accuracy of the fast fault current, which may include several stages during a fault and after its clearance;

(c) with regard to the supply of fast fault current in case of asymmetrical (1-phase or 2-phase) faults, the relevant system operator in coordination with the relevant TSO shall have the right to specify a requirement for asymmetrical current injection.

3. Type B power park modules shall fulfil the following additional requirements in relation to robustness:

(a) the relevant TSO shall specify the post-fault active power recovery that the power park module is capable of providing and shall specify:

(i) when the post-fault active power recovery begins, based on a voltage criterion;

(ii) a maximum allowed time for active power recovery; and

(iii) a magnitude and accuracy for active power recovery;

(b) the specifications shall be in accordance with the following principles:

(i) interdependency between fast fault current requirements according to points (b) and (c) of paragraph 2 and active power recovery;

(ii) dependence between active power recovery times and duration of voltage deviations;

(iii) a specified limit of the maximum allowed time for active power recovery;

(iv) adequacy between the level of voltage recovery and the minimum magnitude for active power recovery; and

(v) adequate damping of active power oscillations.

*Article 21*

**Requirements for type C power park modules**

1. Type C power park modules shall fulfil the requirements listed in Articles 13, except for Article 13(2)(b) and (6), Article 14, except for Article 14(2), Article 15 and Article 20, except for Article 20(2)(a), unless referred to otherwise in point (v) of paragraph 3(d).

2. Type C power park modules shall fulfil the following additional requirements in relation to frequency stability:

(a) the relevant TSO shall have the right to specify that power park modules be capable of providing synthetic inertia during very fast frequency deviations;

(b) the operating principle of control systems installed to provide synthetic inertia and the associated performance parameters shall be specified by the relevant TSO.

3. Type C power park modules shall fulfil the following additional requirements in relation to voltage stability:

(a) with regard to reactive power capability, the relevant system operator may specify supplementary reactive power to be provided if the connection point of a power park module is neither located at the high-voltage terminals of the step-up transformer to the voltage level of the connection point nor at the convertor terminals, if no step-up transformer exists. This supplementary reactive power shall compensate the reactive power demand of the high-voltage line or cable between the high-voltage terminals of the step-up transformer of the power park module or its convertor terminals, if no step-up transformer exists, and the connection point and shall be provided by the responsible owner of that line or cable.

(b) with regard to reactive power capability at maximum capacity:

(i) the relevant system operator in coordination with the relevant TSO shall specify the reactive power provision capability requirements in the context of varying voltage. To that end, it shall specify a U-Q/$P_{max}$-profile that may take any shape within the boundaries of which the power park module shall be capable of providing reactive power at its maximum capacity;

(ii) the U-Q/$P_{max}$-profile shall be specified by each relevant system operator in coordination with the relevant TSO in conformity with the following principles:

— the U-Q/$P_{max}$-profile shall not exceed the U-Q/$P_{max}$-profile envelope, represented by the inner envelope in Figure 8,

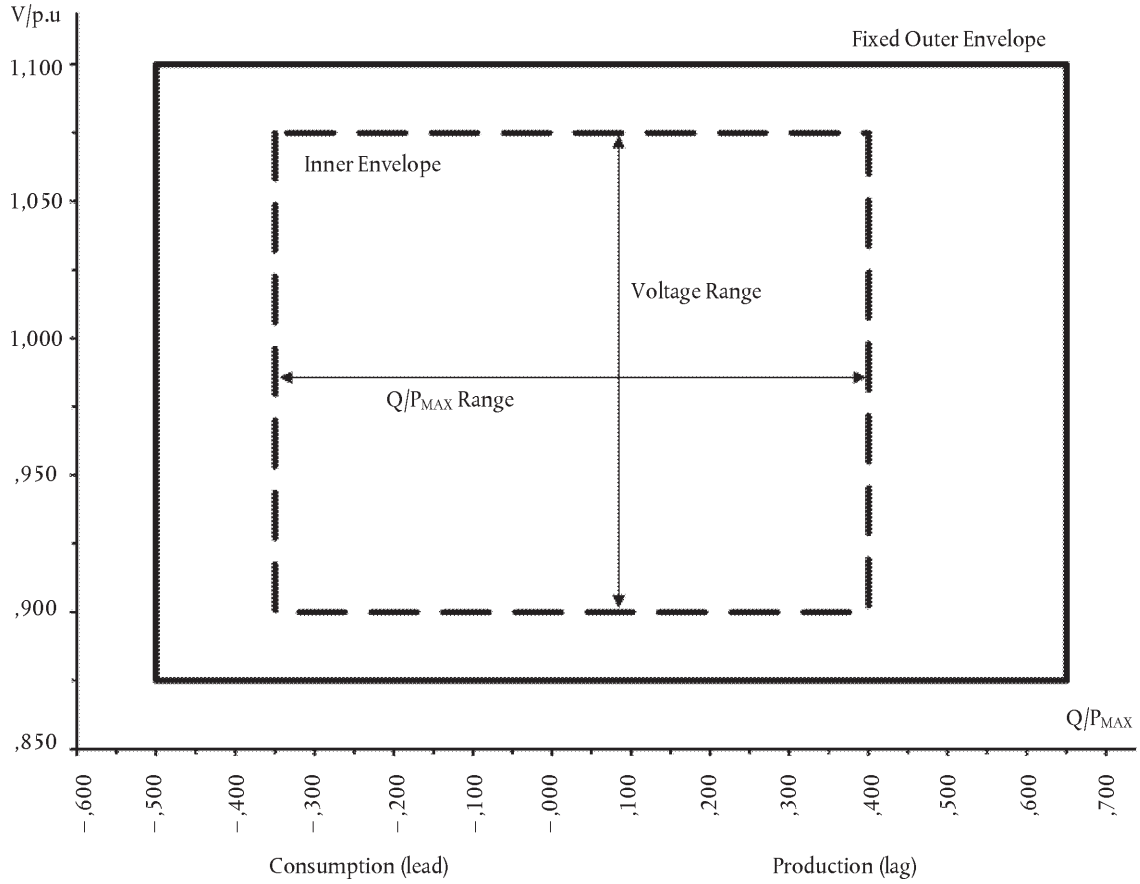
— the dimensions of the U-Q/$P_{max}$-profile envelope (Q/$P_{max}$ range and voltage range) shall be within the values specified for each synchronous area in Table 9,

— the position of the U-Q/$P_{max}$-profile envelope shall be within the limits of the fixed outer envelope set out in Figure 8, and

— the specified U-Q/$P_{max}$ profile may take any shape, having regard to the potential costs of delivering the capability to provide reactive power production at high voltages and reactive power consumption at low voltages;

*Figure 8*

**U-Q/$P_{max}$-profile of a power park module**




The diagram represents boundaries of a U-Q/$P_{max}$-profile by the voltage at the connection point, expressed by the ratio of its actual value and its reference 1 pu value, against the ratio of the reactive power (Q) and the maximum capacity ($P_{max}$). The position, size and shape of the inner envelope are indicative.

*Table 9*

**Parameters for the inner envelope in Figure 8**

| Synchronous area | Maximum range of Q/$P_{max}$ | Maximum range of steady-state voltage level in PU |
|---|---|---|
| Continental Europe | 0,75 | 0,225 |
| Nordic | 0,95 | 0,150 |
| Great Britain | 0,66 | 0,225 |
| Ireland and Northern Ireland | 0,66 | 0,218 |
| Baltic | 0,80 | 0,220 |

(iii) the reactive power provision capability requirement applies at the connection point. For profile shapes other than rectangular, the voltage range represents the highest and lowest values. The full reactive power range is therefore not expected to be available across the range of steady-state voltages;

(c) with regard to reactive power capability below maximum capacity:

(i) the relevant system operator in coordination with the relevant TSO shall specify the reactive power provision capability requirements and shall specify a P-Q/$P_{max}$-profile that may take any shape within the boundaries of which the power park module shall be capable of providing reactive power below maximum capacity;

(ii) the P-Q/$P_{max}$-profile shall be specified by each relevant system operator in coordination with the relevant TSO, in conformity with the following principles:

— the P-Q/$P_{max}$-profile shall not exceed the P-Q/$P_{max}$-profile envelope, represented by the inner envelope in Figure 9,

— the Q/$P_{max}$ range of the P-Q/$P_{max}$-profile envelope is specified for each synchronous area in Table 9,

— the active power range of the P-Q/$P_{max}$-profile envelope at zero reactive power shall be 1 pu,

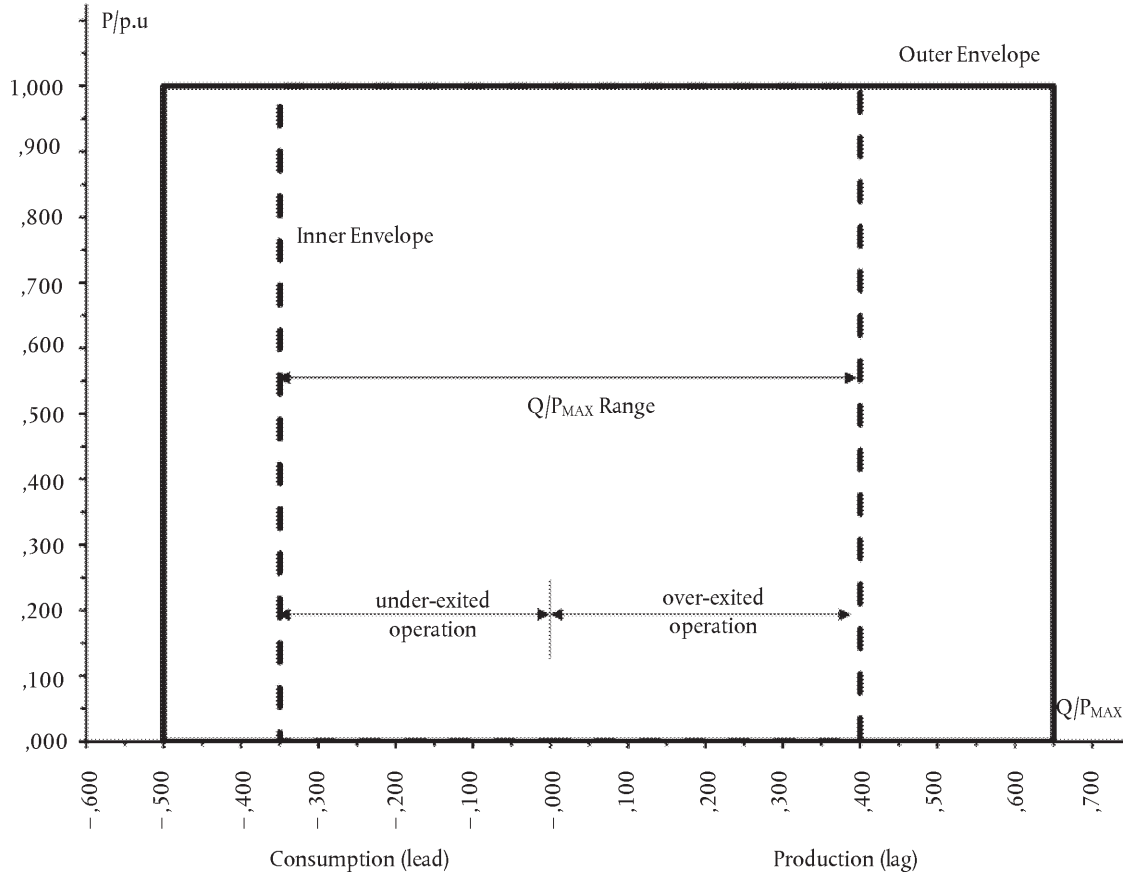
— the P-Q/$P_{max}$-profile can be of any shape and shall include conditions for reactive power capability at zero active power, and

— the position of the P-Q/$P_{max}$-profile envelope shall be within the limits of the fixed outer envelope set out in Figure 9;

(iii) when operating at an active power output below maximum capacity ($P<P_{max}$), the power park module shall be capable of providing reactive power at any operating point inside its P-Q/$P_{max}$-profile, if all units of that power park module which generate power are technically available that is to say they are not out of service due to maintenance or failure, otherwise there may be less reactive power capability, taking into consideration the technical availabilities;

*Figure 9*

**P-Q/$P_{max}$-profile of a power park module**



The diagram represents boundaries of a P-Q/$P_{max}$-profile at the connection point by the active power, expressed by the ratio of its actual value and the maximum capacity pu, against the ratio of the reactive power (Q) and the maximum capacity ($P_{max}$). The position, size and shape of the inner envelope are indicative.

(iv) the power park module shall be capable of moving to any operating point within its P-Q/$P_{max}$ profile in appropriate timescales to target values requested by the relevant system operator;

(d) with regard to reactive power control modes:

(i) the power park module shall be capable of providing reactive power automatically by either voltage control mode, reactive power control mode or power factor control mode;

(ii) for the purposes of voltage control mode, the power park module shall be capable of contributing to voltage control at the connection point by provision of reactive power exchange with the network with a setpoint voltage covering 0,95 to 1,05 pu in steps no greater than 0,01 pu, with a slope having a range of at least 2 to 7 % in steps no greater than 0,5 %. The reactive power output shall be zero when the grid voltage value at the connection point equals the voltage setpoint;

(iii) the setpoint may be operated with or without a deadband selectable in a range from zero to ± 5 % of reference 1 pu network voltage in steps no greater than 0,5 %;

(iv) following a step change in voltage, the power park module shall be capable of achieving 90 % of the change in reactive power output within a time $t_1$ to be specified by the relevant system operator in the range of 1 to 5 seconds, and must settle at the value specified by the slope within a time $t_2$ to be specified by the relevant system operator in the range of 5 to 60 seconds, with a steady-state reactive tolerance no greater than 5 % of the maximum reactive power. The relevant system operator shall specify the time specifications;

(v) for the purpose of reactive power control mode, the power park module shall be capable of setting the reactive power setpoint anywhere in the reactive power range, specified by point (a) of Article 20(2) and by points (a) and (b) of Article 21(3), with setting steps no greater than 5 MVAr or 5 % (whichever is smaller) of full reactive power, controlling the reactive power at the connection point to an accuracy within plus or minus 5 MVAr or plus or minus 5 % (whichever is smaller) of the full reactive power;

(vi) for the purpose of power factor control mode, the power park module shall be capable of controlling the power factor at the connection point within the required reactive power range, specified by the relevant system operator according to point (a) of Article 20(2) or specified by points (a) and (b) of Article 21(3), with a target power factor in steps no greater than 0,01. The relevant system operator shall specify the target power factor value, its tolerance and the period of time to achieve the target power factor following a sudden change of active power output. The tolerance of the target power factor shall be expressed through the tolerance of its corresponding reactive power. This reactive power tolerance shall be expressed by either an absolute value or by a percentage of the maximum reactive power of the power park module;

(vii) the relevant system operator, in coordination with the relevant TSO and with the power park module owner, shall specify which of the above three reactive power control mode options and associated setpoints is to apply, and what further equipment is needed to make the adjustment of the relevant setpoint operable remotely;

(e) with regard to prioritising active or reactive power contribution, the relevant TSO shall specify whether active power contribution or reactive power contribution has priority during faults for which fault-ride-through capability is required. If priority is given to active power contribution, this provision has to be established no later than 150 ms from the fault inception;

(f) with regard to power oscillations damping control, if specified by the relevant TSO a power park module shall be capable of contributing to damping power oscillations. The voltage and reactive power control characteristics of power park modules must not adversely affect the damping of power oscillations.

*Article 22*

**Requirements for type D power park modules**

Type D power park modules shall fulfil the requirements listed in Articles 13, except for Article 13(2)(b), (6) and (7), Article 14, except for Article 14(2), Article 15, except for Article 15(3), Article 16, Article 20 except for Article 20(2)(a) and Article 21.

*CHAPTER 4*

***Requirements for offshore power park modules***

*Article 23*

**General provisions**

1. The requirements set out in this Chapter apply to the connection to the network of AC-connected power park modules located offshore. An AC-connected power park module located offshore which does not have an offshore connection point shall be considered as an onshore power park module and thus shall comply with the requirements governing power park modules situated onshore.

2. The offshore connection point of an AC-connected offshore power park module shall be specified by the relevant system operator.

3. AC-connected offshore power park modules within the scope of this Regulation shall be categorised in accordance with the following offshore grid connection system configurations:

(a) configuration 1: AC connection to a single onshore grid interconnection point whereby one or more offshore power park modules that are interconnected offshore to form an offshore AC system are connected to the onshore system;

(b) configuration 2: meshed AC connections whereby a number of offshore power park modules are interconnected offshore to form an offshore AC system and the offshore AC system is connected to the onshore system at two or more onshore grid interconnection points.

*Article 24*

**Frequency stability requirements applicable to AC-connected offshore power park modules**

The frequency stability requirements laid down respectively in Article 13(1) to (5), except for Article 13(2)(b), Article 15(2) and Article 21(2) shall apply to any AC-connected offshore power park module.

*Article 25*

**Voltage stability requirements applicable to AC-connected offshore power park modules**

1. Without prejudice to point (a) of Article 14(3) and point (a) of Article 16(3), an AC-connected offshore power park module shall be capable of staying connected to the network and operating within the ranges of the network voltage at the connection point, expressed by the voltage at the connection point related to reference 1 pu voltage, and for the time periods specified in Table 10.

2. Notwithstanding the provisions of paragraph 1, the relevant TSO in Spain may require AC-connected offshore power park modules to remain connected to the network in the voltage range between 1,05 pu and 1,0875 pu for an unlimited period.

3. Notwithstanding the provisions of paragraph 1, the relevant TSOs in the Baltic synchronous area may require AC-connected offshore power park modules to remain connected to the 400 kV network in the voltage range and for the time periods that apply to the Continental Europe synchronous area.

*Table 10*

| Synchronous area | Voltage range | Time period for operation |
|---|---|---|
| Continental Europe | 0,85 pu-0,90 pu | 60 minutes |
| | 0,9 pu-1,118 pu (*) | Unlimited |
| | 1,118 pu-1,15 pu (*) | To be specified by each TSO, but not less than 20 minutes and not more than 60 minutes |
| | 0,90 pu-1,05 pu (**) | Unlimited |
| | 1,05 pu-1,10 pu (**) | To be specified by each TSO, but not less than 20 minutes and not more than 60 minutes |
| Nordic | 0,90 pu-1,05 pu | Unlimited |
| | 1,05 pu-1,10 pu (*) | 60 minutes |
| | 1,05 pu-1,10 pu (**) | To be specified by each TSO, but not more than 60 minutes |
| Great Britain | 0,90 pu-1,10 pu (*) | Unlimited |
| | 0,90 pu-1,05 pu (**) | Unlimited |
| | 1,05 pu-1,10 pu (**) | 15 minutes |
| Ireland and Northern Ireland | 0,90 pu-1,10 pu | Unlimited |
| Baltic | 0,85 pu-0,90 pu (*) | 30 minutes |
| | 0,90 pu-1,118 pu (*) | Unlimited |
| | 1,118 pu-1,15 pu (*) | 20 minutes |
| | 0,88 pu-0,90 pu (**) | 20 minutes |
| | 0,90 pu-1,097 pu (**) | Unlimited |
| | 1,097 pu-1,15 pu (**) | 20 minutes |

(*) The voltage base for pu values is below 300 kV.
(**) The voltage base for pu values is from 300 kV to 400 kV.

The table shows the minimum period during which an AC-connected offshore power park module must be capable of operating over different voltage ranges deviating from the reference 1 pu value without disconnecting.

4. The voltage stability requirements specified respectively in points (b) and (c) of Article 20(2) as well as in Article 21(3) shall apply to any AC-connected offshore power park module.

5. The reactive power capability at maximum capacity specified in point (b) of Article 21(3) shall apply to AC-connected offshore power park modules, except for Table 9. Instead, the requirements of Table 11 shall apply.

*Table 11*

**Parameters for Figure 8**

| Synchronous area | Maximum range of $Q/P_{max}$ | Maximum range of steady-state voltage level in PU |
|---|---|---|
| Continental Europe | 0,75 | 0,225 |
| Nordic | 0,95 | 0,150 |
| Great Britain | 0 (*)<br>0,33 (**) | 0,225 |
| Ireland and Northern Ireland | 0,66 | 0,218 |
| Baltic | 0,8 | 0,22 |

(*) At the offshore connection point for configuration 1.
(**) At the offshore connection point for configuration 2.

*Article 26*

**Robustness requirements applicable to AC-connected offshore power park modules**

1. The robustness requirements of power-generating modules laid down in Article 15(4) and Article 20(3) shall apply to AC-connected offshore power park modules.

2. The fault-ride-through capability requirements laid down in point (a) of Article 14(3) and point (a) of Article 16(3) shall apply to AC-connected offshore power park modules.

*Article 27*

**System restoration requirements applicable to AC-connected offshore power park modules**

The system restoration requirements laid down respectively in Article 14(4) and Article 15(5) shall apply to AC-connected offshore power park modules.

*Article 28*

**General system management requirements applicable to AC-connected offshore power park modules**

The general system management requirements laid down in Article 14(5), Article 15(6) and Article 16(4) shall apply to AC-connected offshore power park modules.

TITLE III

**OPERATIONAL NOTIFICATION PROCEDURE FOR CONNECTION**

*CHAPTER 1*

***Connection of new power-generating modules***

*Article 29*

**General provisions**

1. The power-generating facility owner shall demonstrate to the relevant system operator that it has complied with the requirements set out in Title II of this Regulation by completing successfully the operational notification procedure for connection of each power-generating module described in Articles 30 to 37.

2. The relevant system operator shall clarify and make publicly available the details of the operational notification procedure.

*Article 30*

**Operational notification of type A power-generating modules**

1. The operational notification procedure for connection of each new type A power-generating module shall consist of submitting an installation document. The power-generating facility owner shall ensure that the required information is filled in on an installation document obtained from the relevant system operator and is submitted to the system operator. Separate installation documents shall be provided for each power-generating module within the power-generating facility.

The relevant system operator shall ensure that the required information can be submitted by third parties on behalf of the power-generating facility owner.

2. The relevant system operator shall specify the content of the installation document, which shall have at least the following information:

(a) the location at which the connection is made;

(b) the date of the connection;

(c) the maximum capacity of the installation in kW;

(d) the type of primary energy source;

(e) the classification of the power-generating module as an emerging technology according to Title VI of this Regulation;

(f) reference to equipment certificates issued by an authorised certifier used for equipment that is in the site installation;

(g) as regards equipment used, for which an equipment certificate has not been received, information shall be provided as directed by the relevant system operator; and

(h) the contact details of the power-generating facility owner and the installer and their signatures.

3. The power-generating facility owner shall ensure that the relevant system operator or the competent authority of the Member State is notified about the permanent decommissioning of a power-generating module in accordance with national legislation.

The relevant system operator shall ensure that such notification can be made by third parties, including aggregators.

*Article 31*

**Operational notification of type B, C and D power-generating modules**

The operational notification procedure for connection of each new type B, C and D power-generating module shall allow the use of equipment certificates issued by an authorised certifier.

*Article 32*

**Procedure for type B and C power-generating modules**

1. For the purpose of operational notification for connection of each new type B and C power-generating module, a power-generating module document ('PGMD') shall be provided by the power-generating facility owner to the relevant system operator and shall include a statement of compliance.

For each power-generating module within the power-generating facility, separate independent PGMDs shall be provided.

2. The format of the PGMD and the information to be given therein shall be specified by the relevant system operator. The relevant system operator shall have the right to request that the power-generating facility owner include the following in the PGMD:

(a) evidence of an agreement on the protection and control settings relevant to the connection point between the relevant system operator and the power-generating facility owner;

(b) itemised statement of compliance;

(c) detailed technical data of the power-generating module with relevance to the grid connection as specified by the relevant system operator;

(d) equipment certificates issued by an authorised certifier in respect of power-generating modules, where these are relied upon as part of the evidence of compliance;

(e) for Type C power-generating modules, simulation models pursuant to point (c) of Article 15(6);

(f) compliance test reports demonstrating steady-state and dynamic performance as required by Chapters 2, 3 and 4 of Title IV, including use of actual measured values during testing, to the level of detail required by the relevant system operator; and

(g) studies demonstrating steady-state and dynamic performance as required by Chapters 5, 6 or 7 of Title IV, to the level of detail required by the relevant system operator.

3. The relevant system operator, on acceptance of a complete and adequate PGMD, shall issue a final operational notification to the power-generating facility owner.

4. The power-generating facility owner shall notify the relevant system operator or the competent authority of the Member State about the permanent decommissioning of a power-generating module in accordance with national legislation.

5. Where applicable, the relevant system operator shall ensure that the commissioning and decommissioning of Type B and Type C power-generating modules can be notified electronically.

6. Member States may provide that the PGMD shall be issued by an authorised certifier.

*Article 33*

**Procedure for type D power-generating modules**

The operational notification procedure for connection of each new type D power-generating module shall comprise:

(a) energisation operational notification ('EON');

(b) interim operational notification ('ION'); and

(c) final operational notification ('FON').

*Article 34*

**Energisation operational notification for type D power-generating modules**

1. An EON shall entitle the power-generating facility owner to energise its internal network and auxiliaries for the power-generating modules by using the grid connection that is specified for the connection point.

2. An EON shall be issued by the relevant system operator, subject to completion of preparations including agreement on the protection and control settings relevant to the connection point between the relevant system operator and the power-generating facility owner.

*Article 35*

**Interim operational notification for type D power-generating modules**

1. An ION shall entitle the power-generating facility owner to operate the power-generating module and generate power by using the grid connection for a limited period of time.

2. An ION shall be issued by the relevant system operator, subject to completion of the data and study review process as required by this Article.

3. With regard to the data and study review, the relevant system operator shall have the right to request that the power-generating facility owner provide the following:

(a) itemised statement of compliance;

(b) detailed technical data on the power-generating module of relevance to the grid connection as specified by the relevant system operator;

(c) equipment certificates issued by an authorised certifier in respect of power-generating modules, where they are relied upon as part of the evidence of compliance;

(d) simulation models, as specified by point (c) of Article 15(6) and required by the relevant system operator;

(e) studies demonstrating the expected steady-state and dynamic performance as required by Chapter 5, 6 or 7 of Title IV; and

(f) details of intended compliance tests in accordance with Chapters 2, 3 and 4 of Title IV.

4. The maximum period during which the power-generating facility owner may maintain ION status shall be 24 months. The relevant system operator is entitled to specify a shorter ION validity period. An extension of the ION shall be granted only if the power-generating facility owner has made substantial progress towards full compliance. Outstanding issues shall be clearly identified at the time of requesting extension.

5. An extension of the period during which the power-generating facility owner may maintain ION status, beyond the period established in paragraph 4, may be granted if a request for a derogation is made to the relevant system operator before the expiry of that period in accordance with the derogation procedure laid down in Article 60.

*Article 36*

**Final operational notification for type D power-generating modules**

1. A FON shall entitle the power-generating facility owner to operate a power-generating module by using the grid connection.

2. A FON shall be issued by the relevant system operator, upon prior removal of all incompatibilities identified for the purpose of ION status and subject to completion of the data and study review process as required by this Article.

3. For the purposes of the data and study review, the power-generating facility owner must submit the following to the relevant system operator:

(a) an itemised statement of compliance; and

(b) an update of applicable technical data, simulation models and studies as referred to in points (b), (d) and (e) of Article 35(3), including the use of actual measured values during testing.

4. If incompatibility is identified in connection with the issuing of the FON, a derogation may be granted upon a request made to the relevant system operator, in accordance with the derogation procedure described in Title V. A FON shall be issued by the relevant system operator if the power-generating module complies with the provisions of the derogation.

Where a request for a derogation is rejected, the relevant system operator shall have the right to refuse to allow the operation of the power-generating module until the power-generating facility owner and the relevant system operator resolve the incompatibility and the relevant system operator considers that the power-generating module complies with the provisions of this Regulation.

If the relevant system operator and the power-generating facility owner do not resolve the incompatibility within a reasonable time frame, but in any case not later than six months after the notification of the rejection of the request for a derogation, each party may refer the issue for decision to the regulatory authority.

*Article 37*

**Limited operational notification for type D power-generating modules**

1. Power-generating facility owners to whom a FON has been granted shall inform the relevant system operator immediately in the following circumstances:

(a) the facility is temporarily subject to either significant modification or loss of capability affecting its performance; or

(b) equipment failure leading to non-compliance with some relevant requirements.

2. The power-generating facility owner shall apply to the relevant system operator for a LON, if the power-generating facility owner reasonably expects the circumstances described in paragraph 1 to persist for more than three months.

3. A LON shall be issued by the relevant system operator and shall contain the following information which shall be clearly identifiable:

(a) the unresolved issues justifying the granting of the LON;

(b) the responsibilities and timescales for the expected solution; and

(c) a maximum period of validity which shall not exceed 12 months. The initial period granted may be shorter with the possibility of an extension if evidence is submitted to the satisfaction of the relevant system operator demonstrating that substantial progress has been made towards achieving full compliance.

4. The FON shall be suspended during the period of validity of the LON with regard to the items for which the LON has been issued.

5. A further extension of the period of validity of the LON may be granted upon a request for a derogation made to the relevant system operator before the expiry of that period, in accordance with the derogation procedure described in Title V.

6. The relevant system operator shall have the right to refuse to allow the operation of the power-generating module, once the LON is no longer valid. In such cases, the FON shall automatically become invalid.

7. If the relevant system operator does not grant an extension of the period of validity of the LON in accordance with paragraph 5 or if it refuses to allow the operation of the power-generating module once the LON is no longer valid in accordance with paragraph 6, the power-generating facility owner may refer the issue for decision to the regulatory authority within six months after the notification of the decision of the relevant system operator.

*CHAPTER 2*

## *Cost-benefit analysis*

*Article 38*

### Identification of costs and benefits of application of requirements to existing power-generating modules

1. Prior to the application of any requirement set out in this Regulation to existing power-generating modules in accordance with Article 4(3), the relevant TSO shall undertake a qualitative comparison of costs and benefits related to the requirement under consideration. This comparison shall take into account available network-based or market-based alternatives. The relevant TSO may only proceed to undertake a quantitative cost-benefit analysis in accordance with paragraphs 2 to 5, if the qualitative comparison indicates that the likely benefits exceed the likely costs. If, however, the cost is deemed high or the benefit is deemed low, then the relevant TSO shall not proceed further.

2. Following a preparatory stage undertaken in accordance with paragraph 1, the relevant TSO shall carry out a quantitative cost-benefit analysis of any requirement under consideration for application to existing power-generating modules that have demonstrated potential benefits as a result of the preparatory stage according to paragraph 1.

3. Within three months of concluding the cost-benefit analysis, the relevant TSO shall summarise the findings in a report which shall:

(a) include the cost-benefit analysis and a recommendation on how to proceed;

(b) include a proposal for a transitional period for applying the requirement to existing power-generating modules. That transitional period shall not be more than two years from the date of the decision of the regulatory authority or where applicable the Member State on the requirement's applicability;

(c) be subject to public consultation in accordance with Article 10.

4. No later than six months after the end of the public consultation, the relevant TSO shall prepare a report explaining the outcome of the consultation and making a proposal on the applicability of the requirement under consideration to existing power-generating modules. The report and proposal shall be notified to the regulatory authority or, where applicable, the Member State, and the power-generating facility owner or, where applicable, third party shall be informed on its content.

5. The proposal made by the relevant TSO to the regulatory authority or, where applicable, the Member State pursuant to paragraph 4 shall include the following:

(a) an operational notification procedure for demonstrating the implementation of the requirements by the existing power-generating facility owner;

(b) a transitional period for implementing the requirements which shall take into account the category of the power-generating module as specified in Article 5(2) and Article 23(3) and any underlying obstacles to the efficient implementation of the equipment modification/refitting.

*Article 39*

**Principles of cost-benefit analysis**

1. Power-generating facility owners and DSOs including CDSOs shall assist and contribute to the cost-benefit analysis undertaken according to Articles 38 and 63 and provide the necessary data as requested by the relevant system operator or relevant TSO within three months of receiving a request, unless agreed otherwise by the relevant TSO. For the preparation of a cost-benefit-analysis by a power-generating facility owner, or prospective owner, assessing a potential derogation pursuant to Article 62, the relevant TSO and DSO, including CDSO, shall assist and contribute to the cost-benefit analysis and provide the necessary data as requested by the power-generating facility owner, or the prospective owner, within three months of receiving a request, unless agreed otherwise by the power-generating facility owner or the prospective owner.

2. A cost-benefit analysis shall be in line with the following principles:

(a) the relevant TSO, relevant system operator, power-generating facility owner or prospective owner shall base its cost-benefit analysis on one or more of the following calculating principles:

  (i) the net present value;

  (ii) the return on investment;

  (iii) the rate of return;

  (iv) the time needed to break even;

(b) the relevant TSO, relevant system operator, power-generating facility owner or prospective owner shall also quantify socioeconomic benefits in terms of improvement in security of supply and shall include at least:

  (i) the associated reduction in probability of loss of supply over the lifetime of the modification;

  (ii) the probable extent and duration of such loss of supply;

  (iii) the societal cost per hour of such loss of supply;

(c) the relevant TSO, relevant system operator, power-generating facility owner or prospective owner shall quantify the benefits to the internal market in electricity, cross-border trade and integration of renewable energies, including at least:

  (i) the active power frequency response;

  (ii) the balancing reserves;

(iii) the reactive power provision;

(iv) congestion management;

(v) defence measures;

(d) the relevant TSO shall quantify the costs of applying the necessary rules to existing power-generating modules, including at least:

(i) the direct costs incurred in implementing a requirement;

(ii) the costs associated with attributable loss of opportunity;

(iii) the costs associated with resulting changes in maintenance and operation.

TITLE IV

**COMPLIANCE**

*CHAPTER 1*

***Compliance monitoring***

*Article 40*

**Responsibility of the power-generating facility owner**

1. The power-generating facility owner shall ensure that each power-generating module complies with the requirements applicable under this Regulation throughout the lifetime of the facility. For type A power-generating modules, the power-generating facility owner may rely upon equipment certificates, issued as per Regulation (EC) No 765/2008.

2. The power-generating facility owner shall notify to the relevant system operator any planned modification of the technical capabilities of a power-generating module which may affect its compliance with the requirements applicable under this Regulation, before initiating that modification.

3. The power-generating facility owner shall notify the relevant system operator of any operational incidents or failures of a power-generating module that affect its compliance with the requirements of this Regulation, without undue delay, after the occurrence of those incidents.

4. The power-generating facility owner shall notify the relevant system operator of the planned test schedules and procedures to be followed for verifying the compliance of a power-generating module with the requirements of this Regulation, in due time and prior to their launch. The relevant system operator shall approve in advance the planned test schedules and procedures. Such approval by the relevant system operator shall be provided in a timely manner and shall not be unreasonably withheld.

5. The relevant system operator may participate in such tests and record the performance of the power-generating modules.

*Article 41*

**Tasks of the relevant system operator**

1. The relevant system operator shall assess the compliance of a power-generating module with the requirements applicable under this Regulation, throughout the lifetime of the power-generating facility. The power-generating facility owner shall be informed of the outcome of this assessment.

For type A power-generating modules, the relevant system operator may rely upon equipment certificates issued by an authorised certifier for this assessment.

2. The relevant system operator shall have the right to request that the power-generating facility owner carry out compliance tests and simulations according to a repeat plan or general scheme or after any failure, modification or replacement of any equipment that may have an impact on the power-generating module's compliance with the requirements of this Regulation.

The power-generating facility owner shall be informed of the outcome of those compliance tests and simulations.

3. The relevant system operator shall make publicly available a list of information and documents to be provided as well as the requirements to be fulfilled by the power-generating facility owner within the framework of the compliance process. The list shall cover at least the following information, documents and requirements:

(a) all the documentation and certificates to be provided by the power-generating facility owner;

(b) details of the technical data on the power-generating module of relevance to the grid connection;

(c) requirements for models for steady-state and dynamic system studies;

(d) timeline for the provision of system data required to perform the studies;

(e) studies by the power-generating facility owner to demonstrate the expected steady-state and dynamic performance in accordance with the requirements set out in Chapters 5 and 6 of Title IV;

(f) conditions and procedures, including the scope, for registering equipment certificates; and

(g) conditions and procedures for the use of relevant equipment certificates issued by an authorised certifier by the power-generating facility owner.

4. The relevant system operator shall make public the allocation of responsibilities between the power-generating facility owner and the system operator for compliance testing, simulation and monitoring.

5. The relevant system operator may totally or partially delegate the performance of its compliance monitoring to third parties. In such cases, the relevant system operator shall continue ensuring compliance with Article 12, including entering into confidentiality commitments with the assignee.

6. If compliance tests or simulations cannot be carried out as agreed between the relevant system operator and the power-generating facility owner due to reasons attributable to the relevant system operator, then the relevant system operator shall not unreasonably withhold the operational notification referred to in Title III.

*Article 42*

**Common provisions for compliance testing**

1. Testing of the performance of individual power-generating modules within a power-generating facility shall aim at demonstrating that the requirements of this Regulation have been complied with.

2. Notwithstanding the minimum requirements for compliance testing set out in this Regulation, the relevant system operator is entitled to:

(a) allow the power-generating facility owner to carry out an alternative set of tests, provided that those tests are efficient and suffice to demonstrate that a power-generating module complies with the requirements of this Regulation;

(b) require the power-generating facility owner to carry out additional or alternative sets of tests in those cases where the information supplied to the relevant system operator in relation to compliance testing under the provisions of Chapter 2, 3 or 4 of Title IV, is not sufficient to demonstrate compliance with the requirements of this Regulation; and

(c) require the power-generating facility owner to carry out appropriate tests in order to demonstrate a power-generating module's performance when operating on alternative fuels or fuel mixes. The relevant system operator and the power-generating facility owner shall agree on which types of fuel are to be tested.

3. The power-generating facility owner is responsible for carrying out the tests in accordance with the conditions laid down in Chapters 2, 3 and 4 of Title IV. The relevant system operator shall cooperate and not unduly delay the performance of the tests.

4. The relevant system operator may participate in the compliance testing either on site or remotely from the system operator's control centre. For that purpose, the power-generating facility owner shall provide the monitoring equipment necessary to record all relevant test signals and measurements as well as ensure that the necessary representatives of the power-generating facility owner are available on site for the entire testing period. Signals specified by the relevant system operator shall be provided if, for selected tests, the system operator wishes to use its own equipment to record performance. The relevant system operator has sole discretion to decide about its participation.

*Article 43*

**Common provisions on compliance simulation**

1. Simulation of the performance of individual power-generating modules within a power-generating facility shall aim at demonstrating that the requirements of this Regulation have been fulfilled.

2. Notwithstanding the minimum requirements set out in this Regulation for compliance simulation, the relevant system operator may:

(a) allow the power-generating facility owner to carry out an alternative set of simulations, provided that those simulations are efficient and suffice to demonstrate that a power-generating module complies with the requirements of this Regulation or with national legislation; and

(b) require the power-generating facility owner to carry out additional or alternative sets of simulations in those cases where the information supplied to the relevant system operator in relation to compliance simulation under the provisions of Chapter 5, 6 or 7 of Title IV, is not sufficient to demonstrate compliance with the requirements of this Regulation.

3. To demonstrate compliance with the requirements of this Regulation, the power-generating facility owner shall provide a report with the simulation results for each individual power-generating module within the power-generating facility. The power-generating facility owner shall produce and provide a validated simulation model for a given power-generating module. The scope of the simulation models is set out in point (c) of Article 15(6).

4. The relevant system operator shall have the right to check that a power-generating module complies with the requirements of this Regulation by carrying out its own compliance simulations based on the provided simulation reports, simulation models and compliance test measurements.

5. The relevant system operator shall provide the power-generating facility owner with technical data and a simulation model of the network, to the extent necessary to carry out the requested simulations in accordance with Chapter 5, 6 or 7 of Title IV.

*CHAPTER 2*

***Compliance testing for synchronous power-generating modules***

*Article 44*

**Compliance tests for type B synchronous power-generating modules**

1. Power-generating facility owners shall undertake LFSM-O response compliance tests in relation to type B synchronous power-generating modules.

Instead of carrying out the relevant test, power-generating facility owners may rely upon equipment certificates issued by an authorised certifier to demonstrate compliance with the relevant requirement. In such a case, the equipment certificates shall be provided to the relevant system operator.

2. The following requirements with regard to the LFSM-O response test shall apply:

(a) the power-generating module's technical capability to continuously modulate active power to contribute to frequency control in case of any large increase of frequency in the system shall be demonstrated. The steady-state parameters of regulations, such as droop and deadband, and dynamic parameters, including frequency step change response shall be verified;

(b) the test shall be carried out by simulating frequency steps and ramps big enough to trigger at least 10 % of maximum capacity change in active power, taking into account the droop settings and the deadband. If required, simulated frequency deviation signals shall be injected simultaneously at both the speed governor and load controller of the control systems, taking into account the scheme of those control systems;

(c) the test shall be deemed successful if the following conditions are fulfilled:

(i) the test results, for both dynamic and static parameters, meet the requirements set out in Article 13(2); and

(ii) undamped oscillations do not occur after the step change response.

*Article 45*

**Compliance tests for type C synchronous power-generating modules**

1. In addition to the compliance tests for type B synchronous power-generating modules described in Article 44, power-generating facility owners shall undertake the compliance tests set out in paragraphs 2, 3, 4 and 6 of this Article in relation to type C synchronous power-generating modules. Where a power-generating module provides black start capability, power-generating facility owners shall also undertake the tests referred to in paragraph 5. Instead of the relevant test, the power-generating facility owner may use equipment certificates issued by an authorised certifier to demonstrate compliance with the relevant requirement. In that case, the equipment certificates shall be provided to the relevant system operator.

2. The following requirements with regard to the LFSM-U response test shall apply:

(a) it shall demonstrate that the power-generating module is technically capable of continuously modulating active power at operating points below maximum capacity to contribute to frequency control in case of a large frequency drop in the system;

(b) the test shall be carried out by simulating appropriate active power load points, with low frequency steps and ramps big enough to trigger active power change of at least 10 % of maximum capacity, taking into account the droop settings and the deadband. If required, simulated frequency deviation signals shall be injected simultaneously into both the speed governor and the load controller references;

(c) the test shall be deemed successful if the following conditions are fulfilled:

(i) the test results, for both dynamic and static parameters, comply with point (c) of Article 15(2); and

(ii) undamped oscillations do not occur after the step change response.

3. The following requirements with regard to the FSM response test shall apply:

(a) it shall demonstrate that the power-generating module is technically capable of continuously modulating active power over the full operating range between maximum capacity and minimum regulating level to contribute to frequency control. The steady-state parameters of regulations, such as droop and deadband and dynamic parameters, including robustness through frequency step change response and large, fast frequency deviations shall be verified;

(b) the test shall be carried out by simulating frequency steps and ramps big enough to trigger the whole active power frequency response range, taking into account the settings of droop and deadband, as well as the capability to actually increase or decrease active power output from the respective operating point. If required, simulated frequency deviation signals shall be injected simultaneously into the references of both the speed governor and the load controller of the unit or plant control system;

(c) the test shall be deemed successful if the following conditions are fulfilled:

(i) the activation time of full active power frequency response range as a result of a frequency step change is no longer than required by point (d) of Article 15(2);

(ii) undamped oscillations do not occur after the step change response;

(iii) the initial delay time complies with point (d) of Article 15(2);

(iv) the droop settings are available within the range specified in point (d) of Article 15(2) and the deadband (threshold) is not higher than the value specified in that Article; and

(v) the insensitivity of active power frequency response at any relevant operating point does not exceed the requirements set out in point (d) of Article 15(2).

4. With regard to the frequency restoration control test the following requirements shall apply:

(a) the power-generating module's technical capability to participate in frequency restoration control shall be demonstrated and the cooperation of FSM and frequency restoration control shall be checked;

(b) the test shall be deemed successful if the results, for both dynamic and static parameters, comply with the requirements of point (e) of Article 15(2).

5. With regard to the black start capability test the following requirements shall apply:

(a) for power-generating modules with black start capability, this technical capability to start from shut down without any external electrical energy supply shall be demonstrated;

(b) the test shall be deemed successful if the start-up time is kept within the time frame set out in point (iii) of Article 15(5)(a).

6. With regard to the tripping to houseload test the following requirements shall apply:

(a) the power-generating modules' technical capability to trip to and stably operate on house load shall be demonstrated;

(b) the test shall be carried out at the maximum capacity and nominal reactive power of the power-generating module before load shedding;

(c) the relevant system operator shall have the right to set additional conditions, taking into account point (c) of Article 15(5);

(d) the test shall be deemed successful if tripping to house load is successful, stable houseload operation has been demonstrated in the time period set out in point (c) of Article 15(5) and re-synchronisation to the network has been performed successfully.

7. With regard to the reactive power capability test the following requirements shall apply:

(a) the power-generating module's technical capability to provide leading and lagging reactive power capability in accordance with points (b) and (c) of Article 18(2) shall be demonstrated;

(b) the test shall be deemed successful if the following conditions are fulfilled:

(i) the power-generating module operates at maximum reactive power for at least one hour, both leading and lagging, at:

— minimum stable operating level,

— maximum capacity, and

— an active power operating point between those maximum and minimum levels;

(ii) the power-generating module's capability to change to any reactive power target value within the agreed or decided reactive power range shall be demonstrated.

*Article 46*

**Compliance tests for type D synchronous power-generating modules**

1. Type D synchronous power-generating modules are subject to the compliance tests for type B and C synchronous power-generating modules described in Articles 44 and 45.

2. Instead of the relevant test, the power-generating facility owner may use equipment certificates issued by an authorised certifier to demonstrate compliance with the relevant requirement. In such a case, the equipment certificates shall be provided to the relevant system operator.

*CHAPTER 3*

***Compliance testing for power park modules***

*Article 47*

**Compliance tests for type B power park modules**

1. Power-generating facility owners shall undertake LFSM-O response compliance tests in relation to type B power park modules.

Instead of the relevant test, the power-generating facility owner may use equipment certificates issued by an authorised certifier to demonstrate compliance with the relevant requirement. In that case, the equipment certificates shall be provided to the relevant system operator.

2. With regard to type B power park modules, the LFSM-O response tests shall reflect the choice of control scheme selected by the relevant system operator.

3. With regard to the LFSM-O response tests the following requirements shall apply:

(a) the power park module's technical capability to continuously modulate active power to contribute to frequency control in case of increase of frequency in the system shall be demonstrated. The steady-state parameters of regulations, such as droop and deadband, and dynamic parameters shall be verified;

(b) the test shall be carried out by simulating frequency steps and ramps big enough to trigger at least 10 % of maximum capacity change in active power, taking into account the droop settings and the deadband. To perform this test simulated frequency deviation signals shall be injected simultaneously into the control system references;

(c) the test shall be deemed successful in the event that the test results, for both dynamic and static parameters, comply with the requirements set out in Article 13(2).

*Article 48*

**Compliance tests for type C power park modules**

1. In addition to the compliance tests for type B power park modules described in Article 47, power-generating facility owners shall undertake the compliance tests set out in paragraphs 2 to 9 in relation to type C power park modules. Instead of the relevant test, the power-generating facility owner may use equipment certificates issued by an authorised certifier to demonstrate compliance with the relevant requirement. In such a case, the equipment certificate shall be provided to the relevant system operator.

2. With regard to the active power controllability and control range test the following requirements shall apply:

(a) the power park module's technical capability to operate at a load level below the setpoint set by the relevant system operator or the relevant TSO shall be demonstrated;

(b) the test shall be deemed successful if the following conditions are fulfilled:

  (i) the load level of the power park module is kept below the setpoint;

  (ii) the setpoint is implemented according to the requirements laid down in Article 15(2)(a); and

  (iii) the accuracy of the regulation complies with the value specified in point (a) of Article 15(2).

3. With regard to the LFSM-U response test the following requirements shall apply:

(a) the power park module's technical capability to continuously modulate active power to contribute to frequency control in case of a large frequency drop in the system shall be demonstrated;

(b) the test shall be carried out by simulating the frequency steps and ramps big enough to trigger at least 10 % of maximum capacity active power change with a starting point of no more than 80 % of maximum capacity, taking into account the droop settings and the deadband;

(c) the test shall be deemed successful if the following conditions are fulfilled:

(i) the test results, for both dynamic and static parameters, comply with the requirements laid down in Article 15(2)(c); and

(ii) undamped oscillations do not occur after the step change response.

4. With regard to the FSM response test the following requirements shall apply:

(a) the power park module's technical capability to continuously modulate active power over the full operating range between maximum capacity and minimum regulating level to contribute to frequency control shall be demonstrated. The steady-state parameters of regulations, such as insensitivity, droop, deadband and range of regulation, as well as dynamic parameters, including frequency step change response shall be verified;

(b) the test shall be carried out by simulating frequency steps and ramps big enough to trigger the whole active power frequency response range, taking into account the droop settings and the deadband. Simulated frequency deviation signals shall be injected to perform the test;

(c) the test shall be deemed successful if the following conditions are fulfilled:

(i) the activation time of the full active power frequency response range as a result of a frequency step change is no longer than that required by point (d) of Article 15(2);

(ii) undamped oscillations do not occur after the step change response;

(iii) the initial delay is in line with point (d) of Article 15(2);

(iv) the droop settings are available within the ranges specified in point (d) of Article 15(2) and the deadband (threshold) is not higher than the value chosen by the relevant TSO; and

(v) the insensitivity of active power frequency response does not exceed the requirement set out in point (d) of Article 15(2).

5. With regard to the frequency restoration control test the following requirements shall apply:

(a) the power park module's technical capability to participate in frequency restoration control shall be demonstrated. The cooperation of both FSM and frequency restoration control shall be checked;

(b) the test shall be deemed successful if the results for both dynamic and static parameters comply with the requirements of point (e) of Article 15(2).

6. With regard to the reactive power capability test the following requirements shall apply:

(a) the power park module's technical capability to provide leading and lagging reactive power capability in accordance with points (b) and (c) of Article 21(3) shall be demonstrated;

(b) it shall be carried out at maximum reactive power, both leading and lagging, and shall verify the following parameters:

(i) operation in excess of 60 % of maximum capacity for 30 min;

(ii) operation within the range of 30-50 % of maximum capacity for 30 min; and

(iii) operation within the range of 10-20 % of maximum capacity for 60 min;

(c) the test shall be deemed successful if the following criteria are fulfilled:

(i) the power park module operates for a duration no shorter than the requested duration at maximum reactive power, both leading and lagging, in each parameter specified in paragraph 6(b);

(ii) the power park module's capability to change to any reactive power target value within the agreed or decided reactive power range is demonstrated; and

(iii) no protection action takes place within the operation limits specified by the reactive power capacity diagram.

7. With regard to the voltage control mode test the following requirements shall apply:

(a) the power park module's capability to operate in voltage control mode referred to in the conditions set out in points (ii) to (iv) of Article 21(3)(d) shall be demonstrated;

(b) The voltage control mode test shall verify the following parameters:

(i) the implemented slope and deadband according to Article 21(3)(d)(iii);

(ii) the accuracy of the regulation;

(iii) the insensitivity of the regulation; and

(iv) the time of reactive power activation;

(c) The test shall be deemed successful if the following conditions are fulfilled:

(i) the range of regulation and adjustable droop and deadband complies with the agreed or decided characteristic parameters set out in point (d) of Article 21(3);

(ii) the insensitivity of voltage control is not higher than 0,01 pu, in accordance with point (d) of Article 21(3); and

(iii) following a step change in voltage, 90 % of the change in reactive power output has been achieved within the times and tolerances specified in point (d) of Article 21(3).

8. With regard to the reactive power control mode test the following requirements shall apply:

(a) the power park module's capability to operate in reactive power control mode, in accordance with point (v) of Article 21(3)(d), shall be demonstrated;

(b) the reactive power control mode test shall be complementary to the reactive power capability test;

(c) the reactive power control mode test shall verify the following parameters:

(i) the reactive power setpoint range and increment;

(ii) the accuracy of the regulation; and

(iii) the time of reactive power activation.

(d) the test shall be deemed successful if the following conditions are fulfilled:

(i) the reactive power setpoint range and increment are ensured in accordance with point (d) of Article 21(3); and

(ii) the accuracy of the regulation complies with the conditions set out in point (d) of Article 21(3).

9. With regard to the power factor control mode test the following requirements shall apply:

(a) the power park module's capability to operate in power factor control mode in accordance with point (vi) of Article 21(3)(d) shall be demonstrated;

(b) the power factor control mode test shall verify the following parameters:

(i) the power factor setpoint range;

(ii) the accuracy of the regulation; and

(iii) the response of reactive power due to step change of active power;

(c) the test shall be deemed successful if the following conditions are cumulatively fulfilled:

(i) the power factor setpoint range and increment are ensured in accordance with point (d) of Article 21(3);

(ii) the time of reactive power activation as a result of step active power change does not exceed the requirement laid down in point (d) of Article 21(3); and

(iii) the accuracy of the regulation complies with the value specified in point (d) of Article 21(3).

10. With regard to the tests referred to in paragraphs 7, 8 and 9, the relevant system operator may select only one of the three control options for testing.

*Article 49*

**Compliance tests for type D power park modules**

1. Type D power park modules are subject to the compliance tests for type B and C power park modules in accordance with the conditions set out in Articles 47 and 48.

2. Instead of the relevant test, the power-generating facility owner may use equipment certificates issued by an authorised certifier to demonstrate compliance with the relevant requirement. In that case, the equipment certificates shall be provided to the relevant system operator.

*CHAPTER 4*

***Compliance testing for offshore power park modules***

*Article 50*

**Compliance tests for offshore power park modules**

The compliance tests established in Article 44(2), as well as in paragraphs 2, 3, 4, 5, 7, 8 and 9 of Article 48 shall apply to offshore power park modules.

*CHAPTER 5*

***Compliance simulations for synchronous power-generating modules***

*Article 51*

**Compliance simulations for type B synchronous power-generating modules**

1. Power-generating facility owners shall undertake LFSM-O response simulations in relation to type B synchronous power-generating modules. Instead of the relevant simulations, the power-generating facility owner may use equipment certificates issued by an authorised certifier to demonstrate compliance with the relevant requirement. In that case, the equipment certificates shall be provided to the relevant system operator.

2. With regard to the LFSM-O response simulation the following requirements shall apply:

(a) the power-generating module's capability to modulate active power at high frequency in accordance with Article 13(2) shall be demonstrated by simulation;

(b) the simulation shall be carried out by means of high frequency steps and ramps reaching minimum regulating level, taking into account the droop settings and the deadband;

(c) the simulation shall be deemed successful in the event that:

(i) the simulation model of the power-generating module is validated against the compliance test for LFSM-O response described in Article 44(2); and

(ii) compliance with the requirement set out in Article 13(2) is demonstrated.

3. With regard to the simulation of fault-ride-through capability of type B synchronous power-generating modules, the following requirements shall apply:

(a) the power-generating module's capability to ride through faults in accordance with the conditions set out in subparagraph (a) of Article 14(3) shall be demonstrated by simulation;

(b) the simulation shall be deemed successful if compliance with the requirement set out in point (a) of Article 14(3) is demonstrated.

4. With regard to the post fault active power recovery simulation the following requirements shall apply:

(a) the power-generating module's capability to provide post fault active power recovery referred to in the conditions set out in Article 17(3) shall be demonstrated;

(b) the simulation shall be deemed successful if compliance with the requirement set out in Article 17(3) is demonstrated.

*Article 52*

**Compliance simulations for type C synchronous power-generating modules**

1. In addition to the compliance simulations for type B synchronous power-generating modules set out in Article 51, type C synchronous power-generating modules shall be subject to the compliance simulations detailed in paragraphs 2 to 5. Instead of all or part of those simulations, the power-generating facility owner may use equipment certificates issued by an authorised certifier, which must be provided to the relevant system operator.

2. With regard to the LFSM-U response simulation the following requirements shall apply:

(a) the power-generating module's capability to modulate active power at low frequencies in accordance with point (c) of Article 15(2) shall be demonstrated;

(b) the simulation shall be carried out by means of low frequency steps and ramps reaching maximum capacity, taking into account the droop settings and the deadband;

(c) the simulation shall be deemed successful in the event that:

(i) the simulation model of the power-generating module is validated against the compliance test for LFSM-U response described in of Article 45(2); and

(ii) compliance with the requirement of point (c) of Article 15(2) is demonstrated.

3. With regard to the FSM response simulation the following requirements shall apply:

(a) the power-generating module's capability to modulate active power over the full frequency range in accordance with point (d) of Article 15(2) shall be demonstrated;

(b) the simulation shall be carried out by simulating frequency steps and ramps big enough to trigger the whole active power frequency response range, taking into account the droop settings and the deadband;

(c) the simulation shall be deemed successful in the event that:

(i) the simulation model of the power-generating module is validated against the compliance test for FSM response described in Article 45(3); and

(ii) compliance with the requirement of point (d) of Article 15(2) is demonstrated.

4. With regard to the island operation simulation the following requirements shall apply:

(a) the power-generating module's performance during island operation referred to in the conditions set out in point (b) of Article 15(5) shall be demonstrated;

(b) the simulation shall be deemed successful if the power-generating module reduces or increases the active power output from its previous operating point to any new operating point within the P-Q-capability diagram within the limits of point (b) of Article 15(5), without disconnection of the power-generating module from the island due to over- or underfrequency.

5. With regard to the reactive power capability simulation the following requirements shall apply:

(a) the power-generating module's capability to provide leading and lagging reactive power capability in accordance with the conditions set out in points (b) and (c) of Article 18(2) shall be demonstrated;

(b) the simulation shall be deemed successful if the following conditions are fulfilled:

(i) the simulation model of the power-generating module is validated against the compliance tests for reactive power capability described in Article 45(7); and

(ii) compliance with the requirements of points (b) and (c) of Article 18(2) is demonstrated.

*Article 53*

**Compliance simulations for type D synchronous power-generating modules**

1. In addition to the compliance simulations for type B and C synchronous power-generating modules set out in Articles 51 and 52, except for the simulation of fault-ride-through capability of type B synchronous power-generating modules referred to in Article 51(3), type D synchronous power-generating modules are subject to the compliance simulations set out in paragraphs 2 and 3. Instead of all or part of those simulations, the power-generating facility owner may use equipment certificates issued by an authorised certifier, which must be provided to the relevant system operator.

2. With regard to the power oscillations damping control simulation the following requirements shall apply:

(a) it shall be demonstrated that the power-generating module's performance in terms of its control system ('PSS function') is capable of damping active power oscillations in accordance with the conditions set out in paragraph 2 of Article 19;

(b) the tuning must result in improved damping of corresponding active power response of the AVR in combination with the PSS function, compared to the active power response of the AVR alone;

(c) the simulation shall be deemed successful if the following conditions are cumulatively fulfilled:

(i) the PSS function damps the existing active power oscillations of the power-generating module within a frequency range specified by the relevant TSO. That frequency range shall include the local mode frequencies of the power-generating module and the expected network oscillations; and

(ii) a sudden load reduction of the power-generating module from 1 pu to 0,6 pu of the maximum capacity does not lead to undamped oscillations in active or reactive power of the power-generating module.

3. With regard to the simulation of fault-ride-through capability of type D synchronous power-generating modules, the following requirements shall apply:

(a) the power-generating module's capability to provide fault-ride-through in accordance with the conditions set out in point (a) of Article 16(3) shall be demonstrated;

(b) the simulation shall be deemed successful if compliance with the requirement laid down in point (a) of Article 16(3) is demonstrated.

*CHAPTER 6*

***Compliance simulations for power park modules***

*Article 54*

**Compliance simulations for type B power park modules**

1. Type B power park modules are subject to the compliance simulations in paragraphs 2 to 5. Instead of all or part of those simulations, the power-generating facility owner may use equipment certificates issued by an authorised certifier, which must be provided to the relevant system operator.

2. With regard to the LFSM-O response simulation the following requirements shall apply:

(a) the power park module's capability to modulate active power at high frequency in accordance with Article 13(2) shall be demonstrated;

(b) the simulation shall be carried out by means of high frequency steps and ramps reaching minimum regulating level, taking into account the droop settings and the deadband;

(c) the simulation shall be deemed successful in the event that:

(i) the simulation model of the power park module is validated against the compliance test for LFSM-O response set out in Article 47(3); and

(ii) compliance with the requirement laid down in Article 13(2) is demonstrated.

3. With regard to the fast fault current injection simulation the following requirements shall apply:

(a) the power park module's capability to provide fast fault current injection in accordance with the conditions set out in point (b) of Article 20(2) shall be demonstrated;

(b) the simulation shall be deemed successful if compliance with the requirement laid down in point (b) of Article 20(2) is demonstrated.

4. With regard to the fault-ride-through simulation capability of type B power park modules, the following requirements shall apply:

(a) the power park module's capability to ride through faults in accordance with the conditions set out in point (a) of Article 14(3) shall be demonstrated by simulation;

(b) the simulation shall be deemed successful if compliance with the requirement laid down in point (a) of Article 14(3) is demonstrated.

5. The following requirements with regard to the post fault active power recovery simulation shall apply:

(a) the power park module's capability to provide post fault active power recovery in accordance with the conditions set out in Article 20(3) shall be demonstrated;

(b) the simulation shall be deemed successful if compliance with the requirement laid down in Article 20(3) is demonstrated.

*Article 55*

**Compliance simulations for type C power park modules**

1. In addition to the compliance simulations for type B power park modules set out in Article 54, type C power park modules are subject to the compliance simulations set out in paragraphs 2 to 7. Instead of all or part of those simulations, the power-generating facility owner may use equipment certificates issued by an authorised certifier, which must be provided to the relevant system operator.

2. With regard to the LFSM-U response simulation the following requirements shall apply:

(a) the power park module's capability to modulate active power at low frequencies in accordance with point (c) of Article 15(2) shall be demonstrated;

(b) the simulation shall be carried out by simulating low frequency steps and ramps reaching maximum capacity, taking into account the droop settings and the deadband;

(c) the simulation shall be deemed successful in the event that:

(i) the simulation model of the power park module is validated against the compliance test for LFSM-U response set out in Article 48(3); and

(ii) compliance with the requirement laid down in point (c) of Article 15(2) is demonstrated.

3. With regard to the FSM response simulation the following requirements shall apply:

(a) the power park module's capability to modulate active power over the full frequency range as referred to in point (d) of Article 15(2) shall be demonstrated;

(b) the simulation shall be carried out by simulating frequency steps and ramps big enough to trigger the whole active power frequency response range, taking into account the droop settings and the deadband;

(c) the simulation shall be deemed successful in the event that:

(i) the simulation model of the power park module is validated against the compliance test for FSM response set out in Article 48(4); and

(ii) compliance with the requirement laid down in point (d) of Article 15(2) is demonstrated.

4. With regard to the island operation simulation, the following requirements shall apply:

(a) the power park module's performance during island operation in accordance with the conditions set out in point (b) of Article 15(5) shall be demonstrated;

(b) the simulation shall be deemed successful in the event that the power park module reduces or increases the active power output from its previous operating point to any new operating point, within the P-Q-capability diagram and within the limits set out in point (b) of Article 15(5), without disconnection of the power park module from the island due to over- or underfrequency.

5. With regard to the simulation of the capability of providing synthetic inertia, the following requirements shall apply:

(a) the model of the power park module's capability of providing synthetic inertia to a low frequency event as set out in point (a) of Article 21(2) shall be demonstrated;

(b) the simulation shall be deemed successful if the model demonstrates that it complies with the conditions set out in Article 21(2).

6. With regard to the reactive power capability simulation, the following requirements shall apply:

(a) the power park module shall demonstrate that it can provide leading and lagging reactive power capability as set out in points (b) and (c) of Article 21(3);

(b) the simulation shall be deemed successful if the following conditions are cumulatively fulfilled:

(i) the simulation model of the power park module is validated against the compliance tests for reactive power capability set out in paragraph 6 of Article 48; and

(ii) compliance with the requirements laid down in points (b) and (c) of Article 21(3) is demonstrated.

7. With regard to the power oscillations damping control simulation, the following requirements shall apply:

(a) the model of the power park module shall demonstrate that it can provide active power oscillations damping capability accordance with point (f) of Article 21(3);

(b) the simulation shall be deemed successful in the event that the model demonstrates compliance with the conditions described in point (f) of Article 21(3).

*Article 56*

**Compliance simulations for type D power park modules**

1. In addition to the compliance simulations for type B and C power park modules set out in Articles 54 and 55, except for the fault-ride-through capability of type B power park modules referred to in Article 54(4), type D power park modules are subject to the fault-ride-through capability of power park modules compliance simulation.

2. Instead of all or part of the simulations mentioned in paragraph 1, the power-generating facility owner may use equipment certificates issued by an authorised certifier, which must be provided to the relevant system operator.

3. The model of the power park module shall demonstrate that it is suitable for simulating the fault-ride-through capability in accordance with point (a) of Article 16(3).

4. The simulation shall be deemed successful if the model demonstrates compliance with the conditions set out in point (a) of Article 16(3).

*CHAPTER 7*

***Compliance simulations for offshore power park modules***

*Article 57*

**Compliance simulations applicable to offshore power park modules**

The compliance simulations specified in paragraphs 3 and 5 of Article 54 as well as in paragraphs 4, 5 and 7 of Article 55 shall apply to any offshore power park module.

*CHAPTER 8*

***Non-binding guidance and monitoring of implementation***

*Article 58*

**Non-binding guidance on implementation**

1. No later than six months after the entry into force of this Regulation, the ENTSO for Electricity shall prepare and thereafter every two years provide non-binding written guidance to its members and other system operators concerning the elements of this Regulation requiring national decisions. The ENTSO for Electricity shall publish this guidance on its website.

2. ENTSO for Electricity shall consult stakeholders when providing non-binding guidance.

3. The non-binding guidance shall explain the technical issues, conditions and interdependencies which need to be considered when complying with the requirements of this Regulation at national level.

*Article 59*

**Monitoring**

1. ENTSO for Electricity shall monitor the implementation of this Regulation in accordance with Article 8(8) of Regulation (EC) No 714/2009. Monitoring shall cover in particular the following matters:

(a) identification of any divergences in the national implementation of this Regulation;

(b) assessment of whether the choice of values and ranges in the requirements applicable to power-generating modules under this Regulation continues to be valid.

2. The Agency, in cooperation with ENTSO for Electricity, shall produce by 12 months after the entry into force of this Regulation a list of the relevant information to be communicated by ENTSO for Electricity to the Agency in accordance with Article 8(9) and Article 9(1) of Regulation (EC) No 714/2009. The list of relevant information may be subject to updates. ENTSO for Electricity shall maintain a comprehensive, standardised format, digital data archive of the information required by the Agency.

3. Relevant TSOs shall submit to ENTSO for Electricity the information required to perform the tasks referred to in paragraphs 1 and 2.

Based on a request of the regulatory authority, DSOs shall provide TSOs with information under paragraph 2 unless the information is already obtained by regulatory authorities, the Agency or ENTSO-E in relation to their respective implementation monitoring tasks, with the objective of avoiding duplication of information.

4. Where ENTSO for Electricity or the Agency establish areas subject to this Regulation where, based on market developments or experience gathered in the application of this Regulation, further harmonisation of the requirements under this Regulation is advisable to promote market integration, they shall propose draft amendments to this Regulation pursuant to Article 7(1) of Regulation (EC) No 714/2009.

TITLE V

**DEROGATIONS**

*Article 60*

**Power to grant derogations**

1. Regulatory authorities may, at the request of a power-generating facility owner or prospective owner, relevant system operator or relevant TSO, grant power-generating facility owners or prospective owners, relevant system operators or relevant TSOs derogations from one or more provisions of this Regulation for new and existing power-generating modules in accordance with Articles 61 to 63.

2. Where applicable in a Member State, derogations may be granted and revoked in accordance with Articles 61 to 63 by other authorities than the regulatory authority.

*Article 61*

**General provisions**

1. Each regulatory authority shall specify, after consulting relevant system operators and power-generating facility owners and other stakeholders whom it deems affected by this Regulation, the criteria for granting derogations pursuant to Articles 62 and 63. It shall publish those criteria on its website and notify them to the Commission within nine months of the entry into force of this Regulation. The Commission may require a regulatory authority to amend the criteria if it considers that they are not in line with this Regulation. This possibility to review and amend the criteria for granting derogations shall not affect the derogations already granted which shall continue to apply until the scheduled expiry date as detailed in the decision granting the exemption.

2. If the regulatory authority deems that it is necessary due to a change in circumstances relating to the evolution of system requirements, it may review and amend at most once every year the criteria for granting derogations in accordance with paragraph 1. Any changes to the criteria shall not apply to derogations for which a request has already been made.

3. The regulatory authority may decide that power-generating modules for which a request for a derogation has been filed pursuant to Articles 62 or 63 do not need to comply with the requirements of this Regulation from which a derogation has been sought from the day of filing the request until the regulatory authority's decision is issued.

*Article 62*

**Request for a derogation by a power-generating facility owner**

1. Power-generating facility owners, or prospective owners, may request a derogation to one or several requirements of this Regulation for power-generating modules within their facilities.

2. A request for a derogation shall be filed with the relevant system operator and include:

(a) an identification of the power-generating facility owner, or prospective owner, and a contact person for any communications;

(b) a description of the power-generating module or modules for which a derogation is requested;

(c) a reference to the provisions of this Regulation from which a derogation is requested and a detailed description of the requested derogation;

(d) detailed reasoning, with relevant supporting documents and cost-benefit analysis pursuant to the requirements of Article 39;

(e) demonstration that the requested derogation would have no adverse effect on cross-border trade.

3. Within two weeks of receipt of a request for a derogation, the relevant system operator shall confirm to the power-generating facility owner, or prospective owner, whether the request is complete. If the relevant system operator considers that the request is incomplete, the power-generating facility owner, or prospective owner, shall submit the additional required information within one month from the receipt of the request for additional information. If the power-generating facility owner, or prospective owner, does not supply the requested information within that time limit, the request for a derogation shall be deemed withdrawn.

4. The relevant system operator shall, in coordination with the relevant TSO and any affected adjacent DSO or DSOs, assess the request for a derogation and the provided cost-benefit analysis, taking into account the criteria determined by the regulatory authority pursuant to Article 61.

5. If a request for a derogation concerns a type C or D power-generating module connected to a distribution system, including a closed distribution system, the relevant system operator's assessment must be accompanied by an assessment of the request for a derogation by the relevant TSO. The relevant TSO shall provide its assessment within two months of being requested to do so by the relevant system operator.

6. Within six months of receipt of a request for a derogation, the relevant system operator shall forward the request to the regulatory authority and submit the assessment(s) prepared in accordance with paragraphs 4 and 5. That period may be extended by one month where the relevant system operator seeks further information from the power-generating facility owner, or prospective owner and by two months where the relevant system operator requests the relevant TSO to submit an assessment of the request for a derogation.

7. The regulatory authority shall adopt a decision concerning any request for a derogation within six months from the day after it receives the request. That time limit may be extended by three months before its expiry where the regulatory authority requires further information from the power-generating facility owner, or prospective owner, or from any other interested parties. The additional period shall begin when the complete information has been received.

8. The power-generating facility owner, or prospective owner, shall submit any additional information requested by the regulatory authority within two months of such request. If the power-generating facility owner, or prospective owner, does not supply the requested information within that time limit, the request for a derogation shall be deemed withdrawn unless, before its expiry:

(a) the regulatory authority decides to provide an extension; or

(b) the power-generating facility owner, or prospective owner, informs the regulatory authority by means of a reasoned submission that the request for a derogation is complete.

9. The regulatory authority shall issue a reasoned decision concerning a request for a derogation. Where the regulatory authority grants a derogation, it shall specify its duration.

10. The regulatory authority shall notify its decision to the relevant power-generating facility owner, or prospective owner, the relevant system operator and the relevant TSO.

11. A regulatory authority may revoke a decision granting a derogation if the circumstances and underlying reasons no longer apply or upon a reasoned recommendation of the Commission or reasoned recommendation by the Agency pursuant to Article 65(2).

12. For Type A power-generating modules, a request for a derogation under this Article may be made by a third party on behalf of the power-generating facility owner, or prospective owner. Such a request may be for a single power-generating module or multiple, identical power-generating modules. In the case of the latter, and provided the cumulative maximum capacity is specified, the third party may substitute the details required by point (a) of paragraph 2 with their details.

*Article 63*

**Request for a derogation by a relevant system operator or relevant TSO**

1. Relevant system operators or relevant TSOs may request derogations for classes of power-generating modules connected or to be connected to their network.

2. Relevant system operators or relevant TSOs shall submit their requests for derogations to the regulatory authority. Each request for a derogation shall include:

(a) identification of the relevant system operator or relevant TSO, and a contact person for any communications;

(b) a description of the power-generating modules for which a derogation is requested and the total installed capacity and number of power-generating modules;

(c) the requirement or requirements of this Regulation for which a derogation is requested, with a detailed description of the requested derogation;

(d) detailed reasoning, with all relevant supporting documents;

(e) demonstration that the requested derogation would have no adverse effect on cross-border trade;

(f) a cost-benefit analysis pursuant to the requirements of Article 39. If applicable, the cost-benefit analysis shall be carried out in coordination with the relevant TSO and any adjacent DSO or DSOs.

3. Where the request for a derogation is submitted by a relevant DSO or CDSO, the regulatory authority shall, within two weeks from the day after receipt of that request, ask the relevant TSO to assess the request for a derogation in the light of the criteria determined by the regulatory authority pursuant to Article 61.

4. Within two weeks from the day after the receipt of such request for assessment, the relevant TSO shall confirm to the relevant DSO or CDSO whether the request for a derogation is complete. If the relevant TSO considers that it is incomplete, the relevant DSO or CDSO shall submit the required additional information within one month from the receipt of the request for additional information.

5. Within six months of receipt of a request for a derogation, the relevant TSO shall submit to the regulatory authority its assessment, including any relevant documentation. The six-month time limit may be extended by one month where the relevant TSO seeks further information from the relevant DSO or from the relevant CDSO.

6. The regulatory authority shall adopt a decision concerning a request for a derogation within six months from the day after it receives the request. Where the request for a derogation is submitted by the relevant DSO or CDSO, the six-month time limit runs from the day following receipt of the relevant TSO's assessment pursuant to paragraph 5.

7. The six-month time limit referred to in paragraph 6 may, before its expiry, be extended by an additional three months where the regulatory authority requests further information from the relevant system operator requesting the derogation or from any other interested parties. That additional period shall run from the day following the date of receipt of the complete information.

The relevant system operator shall provide any additional information requested by the regulatory authority within two months from the date of the request. If the relevant system operator does not provide the requested additional information within that time limit, the request for a derogation shall be deemed withdrawn unless, before expiry of the time limit:

(a) the regulatory authority decides to provide an extension; or

(b) the relevant system operator informs the regulatory authority by means of a reasoned submission that the request for a derogation is complete.

8. The regulatory authority shall issue a reasoned decision concerning a request for a derogation. Where the regulatory authority grants derogation, it shall specify its duration.

9. The regulatory authority shall notify its decision to the relevant system operator requesting the derogation, the relevant TSO and the Agency.

10. Regulatory authorities may lay down further requirements concerning the preparation of requests for derogation by relevant system operators. In doing so, regulatory authorities shall take into account the delineation between the transmission system and the distribution system at the national level and shall consult with system operators, power-generating facility owners and stakeholders, including manufacturers.

11. A regulatory authority may revoke a decision granting a derogation if the circumstances and underlying reasons no longer apply or upon a reasoned recommendation of the Commission or reasoned recommendation by the Agency pursuant to Article 65(2).

*Article 64*

**Register of derogations from the requirements of this Regulation**

1. Regulatory authorities shall maintain a register of all derogations they have granted or refused and shall provide the Agency with an updated and consolidated register at least once every six months, a copy of which shall be given to ENTSO for Electricity.

2. The register shall contain, in particular:

(a) the requirement or requirements for which the derogation is granted or refused;

(b) the content of the derogation;

(c) the reasons for granting or refusing the derogation;

(d) the consequences resulting from granting the derogation.

*Article 65*

**Monitoring of derogations**

1. The Agency shall monitor the procedure of granting derogations with the cooperation of the regulatory authorities or relevant authorities of the Member State. Those authorities or relevant authorities of the Member State shall provide the Agency with all the information necessary for that purpose.

2. The Agency may issue a reasoned recommendation to a regulatory authority to revoke a derogation due to a lack of justification. The Commission may issue a reasoned recommendation to a regulatory authority or relevant authority of the Member State to revoke derogation due to a lack of justification.

3. The Commission may request the Agency to report on the application of paragraphs 1 and 2 and to provide reasons for requesting or not requesting derogations to be revoked.

TITLE VI

**TRANSITIONAL ARRANGEMENTS FOR EMERGING TECHNOLOGIES**

*Article 66*

**Emerging technologies**

1. With the exception of Article 30, the requirements of this Regulation shall not apply to power-generating modules classified as an emerging technology, in accordance with the procedures set out in this Title.

2. A power-generating module shall be eligible to be classified as an emerging technology pursuant to Article 69, provided that:

(a) it is of type A;

(b) it is a commercially available power-generating module technology; and

(c) the accumulated sales of the power-generating module technology within a synchronous area at the time of application for classification as an emerging technology do not exceed 25 % of the maximum level of cumulative maximum capacity established pursuant to Article 67(1).

*Article 67*

**Establishment of thresholds for classification as emerging technologies**

1. The maximum level of cumulative maximum capacity of power-generating modules classified as emerging technologies in a synchronous area shall be 0,1 % of the annual maximum load in 2014 in that synchronous area.

2. Member States shall ensure that their maximum level of cumulative maximum capacity of power-generating modules classified as emerging technologies is calculated by multiplying the maximum level of cumulative maximum capacity of power-generating modules classified as emerging technologies of a synchronous area with the ratio of annual electrical energy generated in 2014 in the Member State to the total annual electrical energy generated in 2014 in the respective synchronous area to which the Member State belongs.

For Member States belonging to parts of different synchronous areas, the calculation shall be carried out on a pro rata basis for each of those parts and combined to give the total allocation to that Member State.

3. The source of the data for applying this Article shall be the ENTSO for Electricity's *Statistical factsheet* published in 2015.

*Article 68*

**Application for classification as an emerging technology**

1. Within six months of the entry into force of this Regulation manufacturers of Type A power-generating modules may submit to the relevant regulatory authority a request for classification of their power-generating module technology as an emerging technology.

2. In connection with a request pursuant to paragraph 1, the manufacturer shall inform the relevant regulatory authority of the accumulated sales of the respective power-generating module technology within each synchronous area at the time of application for classification as an emerging technology.

3. Proof that a request submitted pursuant to paragraph 1 complies with the eligibility criteria laid down in Articles 66 and 67 shall be provided by the manufacturer.

4. Where applicable in a Member State, assessment of requests and approval and withdrawal of classification as an emerging technology may be undertaken by authorities other than the regulatory authority.

*Article 69*

**Assessment and approval of requests for classification as an emerging technology**

1. By 12 months of the entry into force of this Regulation, the relevant regulatory authority shall decide, in coordination with all the other regulatory authorities of a synchronous area, which power-generating modules, if any, should be classified as an emerging technology. Any regulatory authority of the relevant synchronous area may request a prior opinion from the Agency, which shall be issued within three months of receipt of the request. The decision of the relevant regulatory authority shall take into account the opinion of the Agency.

2. A list of power-generating modules approved as emerging technologies shall be published by each regulatory authority of a synchronous area.

*Article 70*

**Withdrawal of classification as an emerging technology**

1. From the date of the decision of the regulatory authorities pursuant to Article 69(1), the manufacturer of any power-generating module classified as an emerging technology shall submit to the regulatory authority every two months an update of the sales of the module per Member State for the past two months. The regulatory authority shall make publicly available the cumulative maximum capacity of power-generating modules classified as emerging technologies.

2. In the event that the cumulative maximum capacity of all power-generating modules classified as emerging technologies connected to networks exceeds the threshold established in Article 67, the classification as an emerging technology shall be withdrawn by the relevant regulatory authority. The withdrawal decision shall be published.

3. Without prejudice to the provisions of paragraphs 1 and 2, all regulatory authorities of a synchronous area may decide in a coordinated manner to withdraw a classification as an emerging technology. The regulatory authorities of the synchronous area concerned may request a prior opinion from the Agency, which shall be issued within three months of receipt of the request. Where applicable, the coordinated decision of the regulatory authorities shall take into account the opinion of the Agency. The withdrawal decision shall be published by each regulatory authority of a synchronous area.

Power-generating modules classified as emerging technologies and connected to the network prior to the date of withdrawal of that classification as an emerging technology shall be considered as existing power-generating modules and shall therefore only be subject to the requirements of this Regulation pursuant to the provisions of Article 4(2) and Articles 38 and 39.

TITLE VII

**FINAL PROVISIONS**

*Article 71*

**Amendment of contracts and general terms and conditions**

1. Regulatory authorities shall ensure that all relevant clauses in contracts and general terms and conditions relating to the grid connection of new power-generating modules are brought into compliance with the requirements of this Regulation.

2. All relevant clauses in contracts and relevant clauses of general terms and conditions relating to the grid connection of existing power-generating modules subject to all or some of the requirements of this Regulation in accordance with Article 4(1) shall be amended in order to comply with the requirements of this Regulation. The relevant clauses shall be amended within three years following the decision of the regulatory authority or Member State as referred to in Article 4(1).

3. Regulatory authorities shall ensure that national agreements between system operators and owners of new or existing power-generating facilities subject to this Regulation and relating to grid connection requirements for power-generating facilities, in particular in national network codes, reflect the requirements set out in this Regulation.

*Article 72*

**Entry into force**

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

Without prejudice to Articles 4(2)(b), 7, 58, 59, 61 and Title VI, the requirements of this Regulation shall apply from three years after publication.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 14 April 2016.

*For the Commission*

*The President*

Jean-Claude JUNCKER

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